NOVEMBER 1, 1947

Engineering Library

AUTOMOTIVE INDUSTRIES

The Industrial News Authority Devoted to Automotive Products for Land, Air & Water

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Something to Remember . . .

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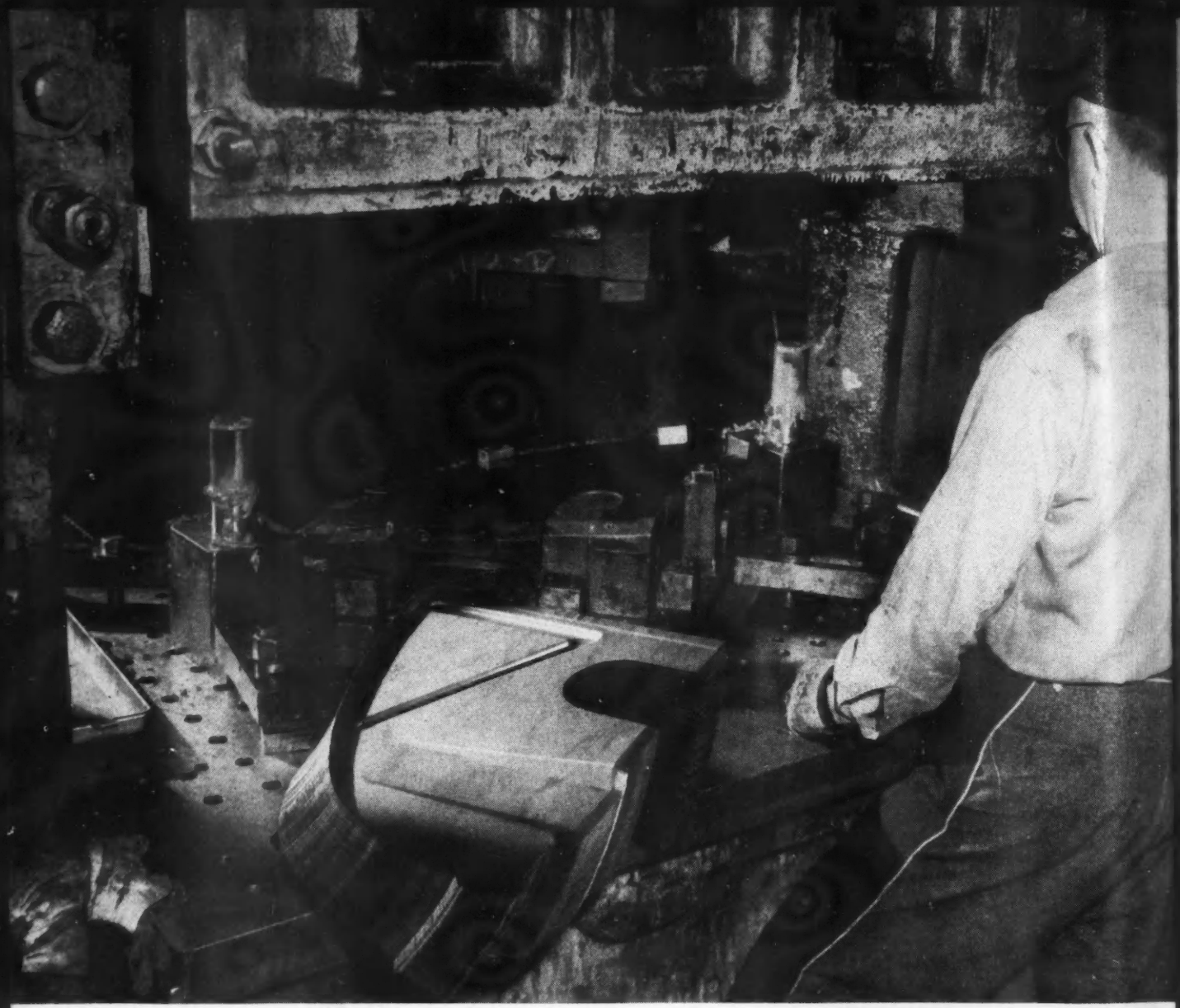
That is because machines of modern ball bearing design are an investment in better, faster transportation or production—as the case may be—but always a move toward lower costs.

NEW DEPARTURE
BALL BEARINGS
3504-F

New Departure, Division of General Motors, Bristol, Conn.



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Stanostamp

NO WONDER Stanostamp gets the stamp of approval from a Midwest metal-working plant. After changing to this superior stamping compound, the plant operator reports a 15% reduction in scrapped stampings—with a corresponding saving in steel and press time—plus a 50% saving in stamping compound.

Shown above is one of the more difficult operations in this plant—stamping 18-gauge steel sheets with a 3½-inch straight draw for coaster wagon bodies.

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STANOSTAMP "C"—a white, heavy fluid paste compound containing an inert, non-abrasive, mineral filler for protection of dies and work. It is particularly recommended for lighter operations.

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STANOSTAMP "G"—a black, heavy fluid paste compound containing graphite in suspension. To be used without blending, it is recommended for severe conditions of deep draws, sharp angles, etc.

All grades of Stanostamp are easily applied, have excellent washability, give adequate rust protection.

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STANDARD SERVICE

AUTOMOTIVE INDUSTRIES

Published Semi-Monthly November 1, 1947 Vol. 97, No. 9

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This Sterling Model RWS160, Young-cooled, carries a net load of more than 13 tons of gasoline over rugged, mountainous terrain.

Mountain grades, desert heat, heavy payloads . . . all add up to tough tests in any trucker's experience . . . mean plenty of punishment for engines and cooling systems. Big haulers in the construction, mining, petroleum and transport industries must have dependable, low-cost, powerful performance. The team of Sterling Motor Trucks and Young Radiator Cores are earning more and more profits for Sterling fleets that hit the highways from California to Maine. The development of the cooling equipment for Sterling Motor Truck Company, Inc., is another example of Young Engineering Service.

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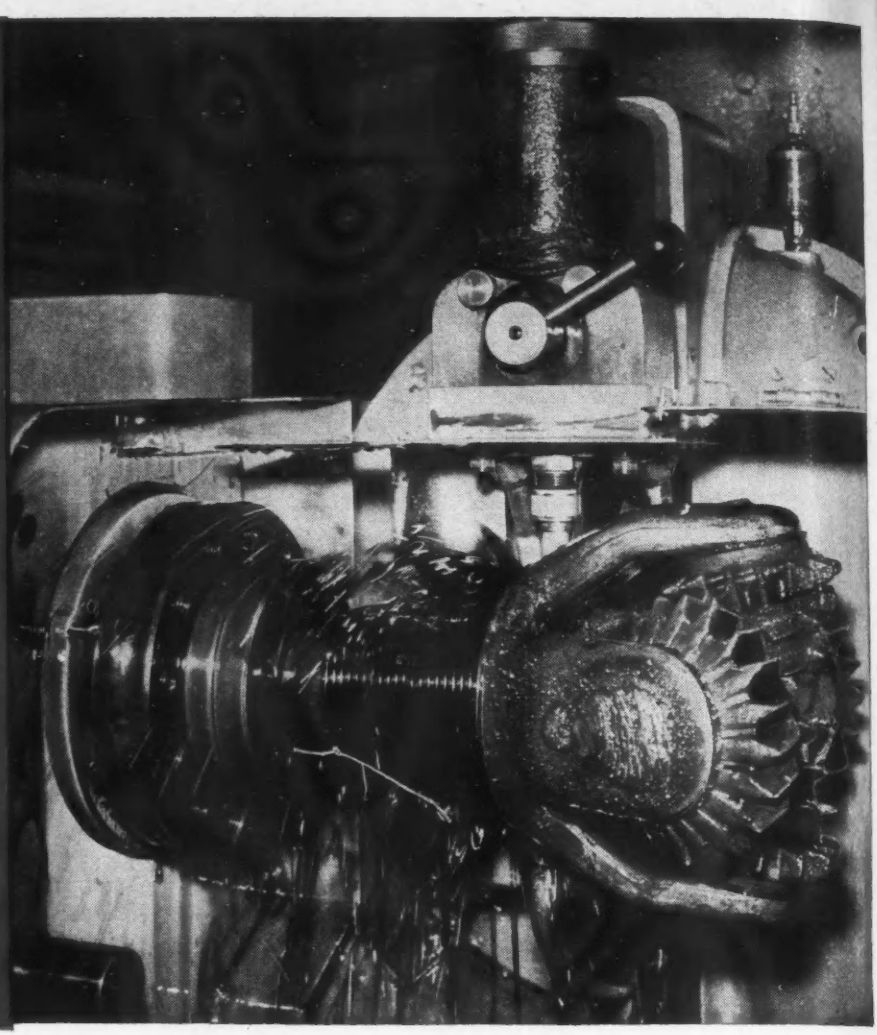
EVEN ON JOBS LIKE THIS . . .

Operation Data:

Steel #4815—Electric Weld
Diameter 4", length 5½", pitch 4
—API Special Form Tapered Thread
Time cycle 4½ minutes
Rate per hour—9
Depth of cut—.165"
RPM of work—4.8
No. of dressings—one per piece
Direction of cut—regular
No. of wheel passes—1; 3-rib wheel
Metal removed per piece—1 lb. (approx.)

Wheel Data:

Norton Abrasive Wheel No. A 80 U 9 BH
Surface speed—1 per min., 10,000 to 12,000
Wheel diameter—16 to 20"
Width—¾"



better finish · longer wheel life · lower costs

THIS thread grinding operation is a tough one, as a glance at the specifications will show you. Yet when *Texaco Grindtex Oil D* was substituted for the oil previously used, the following benefits were immediately secured —

— *Improved finish*
— *Increased wheel life*
— *Less form breakdown*
— *Decrease in oil consumption*
— *Reduction in smoke during grinding*

Because the number of plants that are grinding rather than cutting threads is increasing daily, Texaco has developed special oils to meet the special needs of this relatively new technique. Whatever your thread grinding jobs, Texaco can help you do them faster, with greater accuracy and smoother finish.

A Texaco Lubrication Engineer specializing in cutting coolants will gladly assist you. Just call the nearest of the more than 2500 Texaco distributing plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

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AUTOMOTIVE INDUSTRIES

Published on the first and 15th of the month

November 1, 1947
Volume 97, No. 9

Some High Spots of this Issue

Ford Modernizes Its Buying Methods

Like all businesses, the purchasing activities of the Ford Motor Co. were faced with reconversion problems. In June of last year the whole activities of this department were studied by a picked group of analysts. Ten buying divisions were reduced to seven. A systematic basis of cooperation with suppliers was developed. A control department now renders a monthly progress report which keeps buying and deliveries under control and on schedule. The article begins on page 24, and on page 26 is a chart showing the setup of this new and efficient organization. The article is written by Albert J. Browning, vice president and director of purchases for the Ford Co.

Bendix's New Hydraulic System for Commercial Vehicles

A new hydraulic system for power operation of all control functions in commercial vehicles has been developed by Bendix Products and has been undergoing thorough road tests in a 35-passenger bus. It is described and liberally illustrated in an article which starts on page 30. George W. Pontius of the Bendix Products Division of the Bendix Aviation Corp. is the author.

British Face Severe Reduction in Passenger Car Models

W. F. Bradley, special European correspondent for AUTOMOTIVE INDUSTRIES writes that the number of British car models will be reduced to 42 within the next 18 months. There are now 62. Just what is being done and how is told in the article that starts on page 34.

Delco-Remy Introduces New Facilities for High-Volume Low-Cost Production

Joseph Geschelin, Detroit Editor of AUTOMOTIVE INDUSTRIES, tells how high efficiency has been acquired. The article is liberally illustrated and includes a floor plan of the plant with work routings. See page 36.

Cold Extrusion of Steel

Robert C. Mack, Engineering Editor of AUTOMOTIVE INDUSTRIES, explains, on page 40, how a new process for cold extrusion of steel, now under investigation at the Heintz Manufacturing Co., Philadelphia, may offer a low-cost and high-volume method for producing automobile parts. Illustrations show the important features of the system.

22 New Production Equipment and New Product Items And Other High Spots Such As:

New Hercules Diesel Engines; Improved Franklin Truck and Tractor Engine; New Delcar Delivery Truck; Austin's Body Painting Plant; and Important Aircraft Developments as presented at the SAE National Aeronautic Meeting.

Comprehensive Interpretation of News of the Industries, Page 17

For Complete Table of Contents, See Page 3

AUTOMOTIVE INDUSTRIES

Reg. U. S. Pat. Off.

MATING PARTS HYDRO-BROACHED TO A PERFECT FIT

on CINCINNATI NO. 10-66 DUPLEX

Left: Enlarged view of the two parts broached on the CINCINNATI No. 10-66 Duplex Vertical Hydro-Broach illustrated at the right. Color areas indicate broached surfaces.

Part names—Compressor top head and compressor cylinder

Material—Aluminum

Stock removal—about 1/16"

Production—157 heads and 157 cylinders per hour

CINCINNATI Duplex Hydro-Broach Machines are built in seven sizes, from No. 1-30 to 10-66. No. 10-66 size is illustrated here. Catalog M-1387-1 sent on request.

Mating parts broached in pairs on the same machine offer several advantages. First of all, the parts arrive at the assembly line in the correct quantities and at the same time. Accuracy can be better controlled, too, for one man is responsible for both parts. And because the parts are *broached*, you can figure on minimum cost. ¶These are some of the factors Cincinnati Application Engineers had in mind when they tooled up the machine illustrated . . . a CINCINNATI No. 10-66 Duplex Vertical Hydro-Broach. Two sizes of aluminum compressor top heads are broached in the fixture for the left-hand ram, and two sizes of the mating compressor cylinders are broached in the fixture for the right-hand ram. ¶Perhaps this production idea and CINCINNATI Hydro-Broach Machines could be applied in your shop. Our Application Engineers will help you decide. Send complete data or ask for a visit by one of our field engineers.

THE CINCINNATI MILLING MACHINE CO.

CINCINNATI 9, OHIO, U. S. A.

MILLING MACHINES • BROACHING MACHINES • CUTTER SHARPENING MACHINES

Vol. 97, No. 9

NEWS of the AUTOMOTIVE INDUSTRIES

November 1, 1947

New 1948 Hudson Now in Production

Hudson Motor Car Co. has made excellent progress in its changeover to its new model. Production lines, which were shut down Sept. 19, started to roll out new models about the middle of October and are picking up speed as workmen master the changed techniques. The new car was shown to the press and to Hudson sales personnel at an off-the-record unveiling in Detroit Oct. 27. It is believed, however, that it will be late November or December before the car is put on exhibition.

Steel Prospects Dim Chances For 5 Million Units in 1947

If the U. S. automobile industry can build approximately 108,000 cars and trucks a week for the rest of this year, it will be able to make the five million units in 1947 that has been predicted in some quarters. But, on the basis of industry history, and in view of the uncertain outlook for sheet steel, it is generally conceded that chances to hit the five million mark are very remote. Late in October, the industry passed the four million mark. Previous optimistic forecasts for October production were sadly deflated by the middle of the month when Plymouth assembly lines were down for nearly two weeks and all other Chrysler divisions were at a standstill for one week. It is apparent that the high production achieved during September was made at the expense of October schedules and it is seriously doubted now in the industry that any marked improvement will be reached this year.

Tucker Signs 10-Year Lease With WAA for Chicago-Dodge

Effective Nov. 1, a 10-year lease has been executed by the War Assets Administration with the Tucker Corp. for the surplus Chicago-Dodge plant. For the first two years, Tucker will pay a minimum rental of $500,000 a year, and for each succeeding year $2.4 million or three per cent of the gross sales of product moving out of the plant, whichever is greater.

However, the Tucker Corp. reports that it intends to exercise an option to buy the plant and some machinery for about $40 million. About $30 million will be paid for the real property and about $10 million for machinery over a 20-year period.

K-F Net Profit $6 Million For the First Nine Months

Kaiser-Frazer Corp. has reported a net profit of $8,277,308 for the third quarter and $6,089,269 for the first nine months of 1947. It is expected that scheduled production for the balance of the year will bring 1947 output to about 143,000 units.

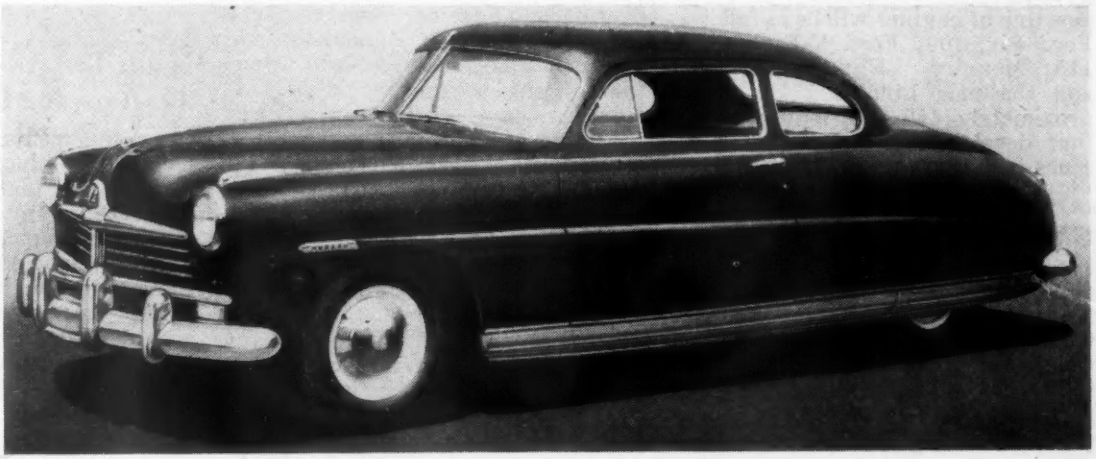
New GM Parts Distribution Plan In Effect November 1

On Nov. 1, General Motors Corp. is placing in effect a new replacement parts distribution plan for all car, truck, Detroit Diesel engine, accessories and parts divisions, covering the distribution of about 275,000 parts to warehouse distributors; retailer-wholesalers, or GM dealers; and retailers, including independent shops, service stations and fleet users. Streamlining its pricing structure, GM will distribute to all channels of trade on a net price basis. GM has classified its parts into several categories: those which are fast moving; moving moderately fast; moving slowly; and those purchased on a demand basis.

Ford to Title Cars As 1948 Models in Nov.

Ford Motor Co. is planning to change the model year designation of its current line sometime in November. Certificates of title will designate the cars as 1948 models; however, no changes in mechanical details or styling are planned. The move is being made to provide year identification for later resale, and may be possibly induced by the fact that new models introduced next

1948 Hudson



The Commodore Eight, six-passenger coupe is shown here. Now in production the new 1948 Hudson is reported to have the lowest center of gravity of any American car together with more headroom than any other mass-produced automobile.

NEWS of the AUTOMOTIVE INDUSTRIES

Rolling Body

The Belknap Hardware & Mfg. Co., Louisville, Ky., designed and patented the castered body shown above, which is used on the company's Mack trucks. In the shape of a large freight box, the castered body can be rolled on or off the truck by means of the rear-mounted winch, while a hydraulic hoist at the rear elevates the channel steel track to clear any loading dock.

year will probably be called 1949 cars.

Crosley Profit Is $476,065 For First Year's Operations

Operations for the first full year ending July 31, 1947, resulted in a net income of $476,065 on sales of $12,073,721, Crosley Motors, Inc., has disclosed. Postwar Crosleys totaling 16,637 had been delivered by the end of fiscal 1947, and according to the report, production has risen from 1709 cars in April to 2410 for the month of September, 1947.

Say That New Ford Engines Will Have More Horsepower

Sources close to Ford Motor Co. estimate that the horsepower of the new line of engines will be as follows: Ford Six, 100; Ford V-Eight, 100-115; Mercury V-Eight, about 125; and the new Lincoln V-Eight approximately 150. It is understood that development of these new engines has been practically completed.

GM Plans to Start Output Of Australian Car in 1948

If present plans materialize, GM will start production of its new lightweight automobile in Australia during the second half of 1948. It is reported that $9,750,000 has been spent already on the project, and that total costs will amount to more than $21 million. Three models of the cars were built in this country last year, and have been undergoing testing in Australia. It is reported that considerable production equipment to build the car has been shipped to that country.

K-F Plans to Build New $10 Million Engine Plant

In line with its ambitious program to boost ultimate production of its cars to four or five times the present level, Kaiser-Frazer Corp. has announced that it intends to spend about $3 million on expansion of facilities at the Detroit Engine Div. and approximately $10 million for a new engine plant of its own. At a birthday dinner given in Detroit recently in honor of E. J. Hunt, production manager for K-F, Edgar J. Kaiser, president, announced the plans, but declined to state where the new engine plant would be built. However, it is considered a likely possibility that the plant will be erected at Willow Run, since the company has ample space there and adequate facilities. Kaiser also revealed that plans call for adding another shift at Willow Run early next year, and completion of the assembly plant at Long Beach, Calif., some time next summer. The company expects to boost production to 1500 cars a day by next spring, and to 2000 to 2500 per day by next fall. K-F currently is engaged in an expansion program which calls for the signing of associate dealerships to augment the present sales force of about 4000 dealers and 140 distributors. New regional sales and service offices are being opened throughout the country, and a strong field force will aid dealers in training service personnel.

1948 Pontiacs to Offer Hydramatic Transmissions

GM's Pontiac Motor Div. has announced that on both the six and eight cyl 1948 models, hydramatic transmissions will be offered as optional equipment. The 1948 models will go into production soon after Jan. 1, according to the plans at present.

Mooney Says Dollar Shortage Shrinks Export Truck Market

James D. Mooney, president of Willys-Overland Motors, has confirmed trade reports that the export market for automotive vehicles is not as lush as it has been in previous months. He said that dollar shortages are affecting the export market, but that his company still can sell abroad all of the products it can produce at present. Current Willys exports are running 25 to 30 per cent of its total production, by far the largest percentage of any automobile company. Willys expects to produce 200,000 units during the next year and expects to have a capacity of 300,000 cars annually when its current expansion program is completed. Full scale operation will require three shifts in the machine shops. Peak production at Willys will be reached about mid-1949, Mooney said, and will require from 15,000 to 18,000 employees, more than double the current number.

Hahn Motors to Make Tractors for Haney

Arrangements have been completed to produce Bull Terrier tractors in the facilities of Hahn Motors, Inc., Hamburg, Pa., it was recently announced by the Haney Corp., Philadelphia. Haney will continue to make Bull Terrier tractors, which are powered by a 12.5 hp, air-cooled engine, in Kansas City, Mo. It is expected that the additional facilities will permit production of about 100 tractors a day from the two lines.

New Small Tractor Features Half Tracks

Of simple design and construction, a new small tractor, the Super-Trac, has been announced by Super-Trac, Inc., Chicago. With tracks instead of rear wheels, the new tractor, powered by a rear mounted one cyl, six hp, air-cooled engine, with mechanical governor, has a forward and reverse gear and a single dry disk clutch. Weighing about 750 lb, the Super-Trac has an overall length of 7.5 ft; an overall width of 33 in.; a tread of 28 in.; and a crop clearance of 20 in. Speed up to 2.75 mph, governor controlled, can be obtained. The tracks are V-belts of corrugated rubber, cord-reinforced, and run on bogie wheels with self lubricated bearings. A built-in power take-off is available.

Off-Highway Heavy

International Harvester's new four-wheel, heavy-duty off-highway truck, Model KBR-14, is especially designed for logging, construction, strip mining, and similar operations. With a GVW of 32,000 to 41,600 lb, this model is powered by the six-cyl International-Continental R-6586 valve-in-head engine.

GM's Brown-Lipe-Chapin Plant Opens in Elyria, O.

Recently opened, GM's Brown-Lipe-Chapin plant at Elyria, O., is operating at 20 per cent of capacity, and at the present has 500 employes. It is manufacturing hub caps, bumper guards and ornamental die castings.

Easing of Credit Controls To Fatten New Car Backlog

About the only concrete effect the lifting of credit controls Nov. 1 will have will be to put the automobile industry further behind on orders, according to automobile and finance company spokesman. Used car dealers believe that it will enhance the market for late model cars to some degree, but may make older models more difficult to finance. As far as new car market demand is concerned, it is believed that many persons who had held off buying because of high monthly payments will now come into the market. However, they will be at the end of the list. As far as terms are concerned it is expected they will remain at one-third down, but that the installment period will be extended to as high as 24 months. It is estimated that monthly payments can be reduced from previous levels of from $70 to $100 a month to about $45. One effect of the dropping of regulations is that finance companies now will not loan up to the full cash value on older cars as they normally would under Regulation W.

Hayes Body Corp. to Make Stampings for Tucker Car

Tucker Corp. has awarded a contract for preparation of body dies and stampings to Hayes Body Corp. In making the announcement, Preston T. Tucker, president of the automobile company, said that he hopes to receive the first shipment of stampings before Christmas in order to complete a pre-production run of cars now in the process of manufacture by the first of the year. Tucker officials also have indicated that the company has been considering possible purchase of a steel plant to insure a supply of sheet steel for the new car.

Tracked Tractor

Featuring tracks instead of rear wheels, the Super-Trac has been designed for fabrication largely with simple stampings. The retail price tag will be $500, it was announced.

First Postwar Rolls Royce and Bentley Models Shown

A report from New York says that the first postwar Rolls Royce and Bentley automobiles have arrived from England, and will be displayed in various major cities. All custom built models, the cars will sell from $18,450 to $19,100 for the Rolls Royce and from $12,900 to $17,000 for the Bentley. The cars will be displayed in New York City, Nov. 6—7. Admission is by invitation only.

New Passenger Car Registrations*

Arranged by Makes in Descending Order According to the 1947 Eight Months' Totals.

MAKE	August 1947	July 1947	August 1946	EIGHT MONTHS Units 1947	Units 1946	Per Cent of Total 1947	Per Cent of Total 1946
Chevrolet	53,459	59,676	38,412	429,421	124,613	20.82	14.40
Ford	42,082	39,479	37,058	337,201	169,874	16.35	19.63
Plymouth	27,284	23,120	24,625	206,637	123,091	10.02	14.22
Buick	19,995	19,935	14,012	154,774	43,374	7.50	5.01
Pontiac	16,242	18,390	11,475	136,786	43,278	6.63	5.00
Dodge	19,720	16,793	16,048	134,943	80,343	6.54	9.28
Oldsmobile	14,285	15,212	8,375	119,576	33,064	5.80	3.82
Nash	8,201	7,508	7,575	70,416	48,632	3.41	5.62
Mercury	6,881	7,694	6,816	68,937	27,341	3 34	3.16
Hudson	8,672	9,038	6,788	67,768	40,273	3.29	4.65
Studebaker	7,521	8,715	6,578	67,221	27,423	3.26	3.17
Chrysler	8,604	7,396	7,940	60,918	39,135	2.95	4.52
De Soto	6,740	5,632	5,966	46,761	34,253	2.27	3.96
Cadillac	4,612	4,690	2,154	34,808	8,922	1.69	1.03
Packard	4,331	3,807	3,771	29,341	16,748	1.42	1.93
Kaiser	5,602	4,137	2	28,352	2	1.37	.....
Frazer	5,571	5,984	1	26,690	1	1.29	.....
Lincoln	1,564	2,235	1,524	16,056	4,682	.78	.54
Willys	2,025	2,298	.....	15,623	.....	.76	.....
Crosley	1,387	1,356	139	10,171	229	.49	.03
All Others	88	72	57	551	298	.02	.03
Total	264,866	263,167	199,316	2,062,951	865,576	100.00	100.00

* Data from R. L. Polk & Co.

Automobile Old Timers Hold 8th Annual Reunion in N.Y.

Celebrating the national organization's eighth anniversary, the Automobile Old Timers will hold a reception and annual luncheon-meeting in New York City on Nov. 12. Distinguished Service Citations will be awarded to Alfred P. Sloan, Jr., chairman of the board, General Motors Corp.; William L. Hughson, San Francisco, president, Northern California Council of the automobile pioneers group, and past president of the NADA; George R. Robertson, winner of the Vanderbilt Cup Race in 1908, driving a Locomobile; and William G. Bryant, Detroit organizer of the Automobile Club of Michigan.

Aerco of Calif. Makes Two New Tractor Models

The Aerco Corp., Burbank, Calif., is now producing two new Earthmaster tractor models, C and CH. General purpose farm tractors, the Earthmaster models feature a two-way hydraulic control system called "Duomatic," assuring positive lowering, raising, and depth control of implements. Weighing 1450 lb, the tractor is powered by a 14.5 hp, four-cyl, L-head engine, and the transmission provides three speeds forward and one reverse. With a 66 in. wheelbase, Model C has 20 in. clearance, and the CH 24.5 in. clearance. By lowering the front axles on spindles and by changing the position of

Divide L-M and Ford Field Sales Forces

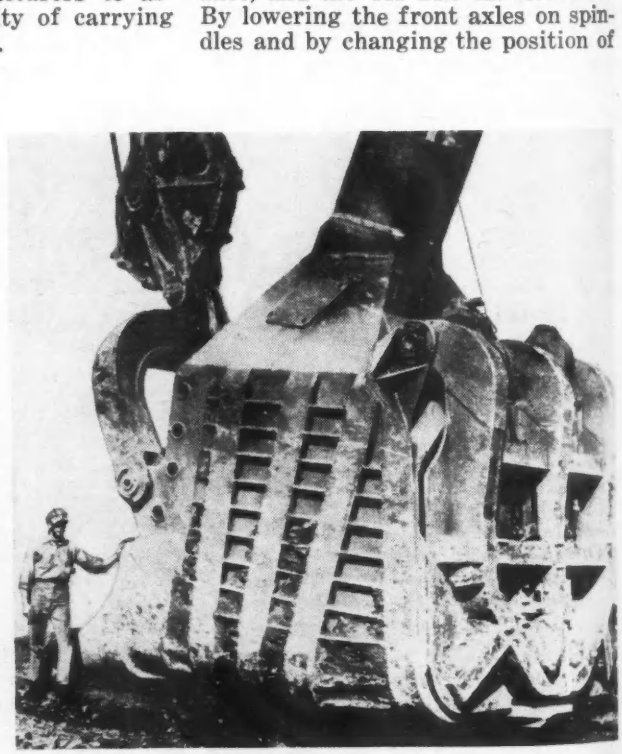
Another step in separating the Lincoln-Mercury and Ford divisions has been taken with the announcement that the Lincoln-Mercury and Ford field sales forces have been completely divorced. Ford regional managers, it was announced, have been removed from any responsibility for the sale and servicing of Lincoln and Mercury cars, and Lincoln-Mercury field sales activities will be under the direction of 21 Lincoln-Mercury district managers who will report directly to the home office in Detroit.

Rubber Companies Want Law Requiring Synthetic in Tires

The nation's tire manufacturers through P. W. Litchfield, chairman of the board of Goodyear Tire & Rubber Co., are urging Congress to enact legislation requiring the use of a minimum of 100,000 tons of synthetic rubber annually in tires, tubes and recapping material. Mr. Litchfield pointed out that since there are only 26 manufacturers of tires and tubes the enforcement program would be simplified, and the need for an extensive bureau of control would be eliminated. He also advocated that the government continue ownership of the highest efficiency and lowest cost plants having a minimum capacity of 600,000 tons of general synthetic rubber. He also advocated that the government accumulate and control a substantial stockpile of natural rubber for emergency use, and that it encourage development of potential rubber growing areas in the Western Hemisphere to a point where they will produce a minimum annual yield of 100,000 tons. He added the government could fix a minimum synthetic content for specified tires, leaving it up to the manufacturers to assume the responsibility of carrying out the requirements.

Big Biter

Designed to lift 40 cu yd of earth in one bite, this huge shovel dipper, operated by the M. A. Hanna Co., Cleveland, was built by the Marion Power Shovel Co., Marion, O. Called the world's largest, this dipper, of all-welded construction, has a door, 10 ft in width and height, which is hung on three hinges, each on a four ft center with two rubber bushings on each hinge. These bushings were especially developed by Firestone Industrial Products Co.



the rear axle drop housings on the rear axle housings, either model can be set in a lower position.

GM Opens New Plant In Wilmington, Del.

Capable of producing 640 new cars a day, a new assembly plant has been opened by General Motors Corp. in Wilmington, Del. With full production not expected for several months, only 800 persons are now employed out of an expected maximum force of 2000.

New Industry-Financed MIT Gas Turbine Laboratory

An industry-sponsored gas turbine laboratory was recently opened by the Massachusetts Institute of Technology in Cambridge, Mass. The facilities will be used for advanced instruction and research in this field. The two-story laboratory was financed by grants totaling over $500,000 from Alfred P. Sloan, Jr., chairman of the board, General Motors Corp., General Electric Co., United Aircraft Corp., Curtiss-Wright Corp., Westinghouse Electric Corp., and General Machinery Corp.

Deere & Co. Buys WAA Plant in Des Moines, Iowa

Deere & Co., Moline, Ill., has purchased the industrial portion of the Des Moines, Iowa, Ordnance Plant from the War Assets Administration for $4,150,000.

New Car Orders Piling Up Faster Than Deliveries

Orders for new cars are still piling up on the books of dealers throughout the country at a rate faster than current deliveries. L. W. Ward, general sales manager of GM's Pontiac Motor Div., says that orders for Pontiacs have increased approximately 200,000 since the first of this year, despite delivery of an average of 5000 cars a week.

WAA to Discontinue Surplus Vehicle Sales

If present plans for WAA go through, surplus motor vehicle sales will be a thing of the past by next June 30. A recent change in sales policy permits the sale for scrap of any vehicles for which there has been no demand. It is estimated that by the end of next June, WAA will have disposed of more than a half million vehicles, most of which were trucks. Return to the government will be more than a billion dollars, representing about 40 per cent of acquisition costs.

Indian To Make New Type of Motorcycle

A radically new type of motorcycle will be produced by the Indian Motocycle Co. in a newly acquired war surplus plant in East Springfield, Mass. The company also intends to build lightweight lower priced motorcycles.

Two Engine Projects at England's Turbine Center

England's National Gas Turbine Establishment at Whetstone, Leicestershire, has two turbine projects under development. Called the Long Range 1, the first is a 5000 hp multistage, axial flow, turbo-prop in which air is forced into conventional combustion chambers from a centrifugal compressor at the end of the axial stages. The compressor is driven by a two stage turbine, which also drives, through gearing, a contra-rotating mechanism for a propeller. Described as a "250 hp," the other project is an extremely small turbine with a max diam of approximately 14 in., a two-stage centrifugal compressor, six combustion chambers and a two-stage turbine wheel. The turbine blades are precision cast Vitallium. Maximum rotational speed is 35,000 rpm.

1948 Trailer Coach Show In Philadelphia, Nov. 8-15

Previewing 150 1948 model trailer coaches, representing over 40 manufacturers, the 13th annual National Trailer Coach Show will be held in Philadelphia, Nov. 8-15.

Warner Directs Pub. Relations For McCann-Erickson, Detroit

Edward L. Warner, Jr., is now director of public relations in McCann-Erickson, Inc.'s, Detroit office, directing public relations on the Briggs Mfg. Co. and other Detroit accounts. Mr. Warner was formerly manager of the Aviation Div., Automotive & Aviation Parts Manufacturers, Inc., and prior to that was associated in an editorial capacity with AUTOMOTIVE INDUSTRIES.

New Caterpillar Tractor Factory in Peoria, Ill.

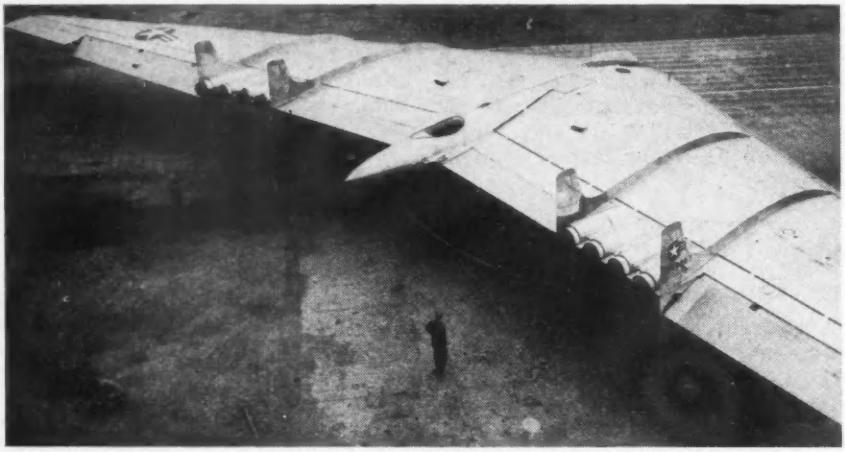
Caterpillar Tractor Co., Peoria, Ill., has started construction of a new factory for earthmoving equipment. The new factory will provide about 785,000 sq ft of manufactur-

New Truck Registrations*

Arranged by Makes in Descending Order According to the Eight Months' 1947 Totals.

MAKE	August 1947	July 1947	August 1946	EIGHT MONTHS Units 1947	Units 1946	Per Cent of Total 1947	Per Cent of Total 1946
Ford	18,342	17,735	9,667	138,919	69,278	23.93	19.93
Chevrolet	18,931	13,789	19,750	137,534	84,986	23.69	24.45
Dodge	10,851	11,608	9,251	87,043	63,212	14.99	18.19
International	10,553	9,858	8,155	74,624	45,703	12.85	13.44
G. M. C.	2,185	3,479	3,166	33,164	10,681	5.71	3.07
Willys	5,298	5,132	5,483	31,087	24,728	5 35	7.11
Studebaker	3,652	3,502	3,034	27,632	13,900	4.76	4.00
Reo	829	980	1,076	9,021	5,722	1.55	1.65
White	1,016	1,143	820	8,682	5,990	1.50	1.72
Mack	1,104	1,034	284	6,933	4,164	1.19	1.20
Diamond T	905	917	120	6,849	3,039	1.18	.87
Federal	520	543	397	3,818	2,841	.65	.82
Auto Car	289	388	427	3,091	2,883	.53	.83
Divco	293	414	336	3,061	2,400	.53	.69
Brockway	358	381	325	2,885	2,417	.50	.70
Hudson	220	160	227	2,197	1,663	.38	.48
F. W. D.	59	95	38	792	361	.14	.10
Sterling	41	76	34	405	344	.07	.10
Ward La France	40	42	.....	371	.....	.06	.....
Oshkosh	14	30	.....	164	.....	.03	.....
All Others	412	335	310	2,364	2,242	.40	.65
Totals	75,912	71,647	62,820	580,639	347,545	100.00	100.00

* Data from R. L. Polk & Co.



Winged by Eight Jets

Recently flown for 34 min, the USAF Northrop YB-49 Flying Wing is powered by eight G-E TG-180 turbojets, each developing about 4000 lb of thrust, housed wholly within the wing. Measuring 172 ft from wing tip to wing tip, the huge YB-49 is an all-metal airplane, weighing 88,100 lb empty with a maximum weight when loaded of over 200,000 lb.

ing space for facilities for the manufacture of Diesel wheel-type tractors and Diesel motor graders and for the final assembly of scrapers, wagon and rippers.

New Plant in E. Hartford For Hamilton Std. Prop.

Construction of a 20,000 sq ft addition to the plant of Hamilton Standard Propellers Div., United Aircraft Corp. at East Hartford, Conn., has been started, it was recently announced. At the same time, the division is withdrawing men and machines from its West Hartford branch plant, which occupies a portion of the Pratt & Whitney Div., Niles-Bemont-Pond factory.

Rockelman Made Executive Vice President of Tucker

Fred Rockelman, former vice president in charge of sales, has replaced Hanson A. Brown as executive vice president of the Tucker Corp. Matthew Brettenbach, former assistant controller, has been named controller to succeed James Stearns.

GM's Cunningham President of Internal Auditors Group

Earle H. Cunningham, general auditor, General Motors Corp., was recently elected president of the Institute of Internal Auditors, Inc., for the coming year.

Ryan Now Producing Navion Personal Plane

The Ryan Aeronautical Co. recently disclosed that the first Ryan-built Navions are now coming off the assembly line in San Diego, Calif. Incorporating refinements in details, production of Navions is steadily increasing.

Jessop Stainless-Clad Steel For '48 Car & Truck Bumpers

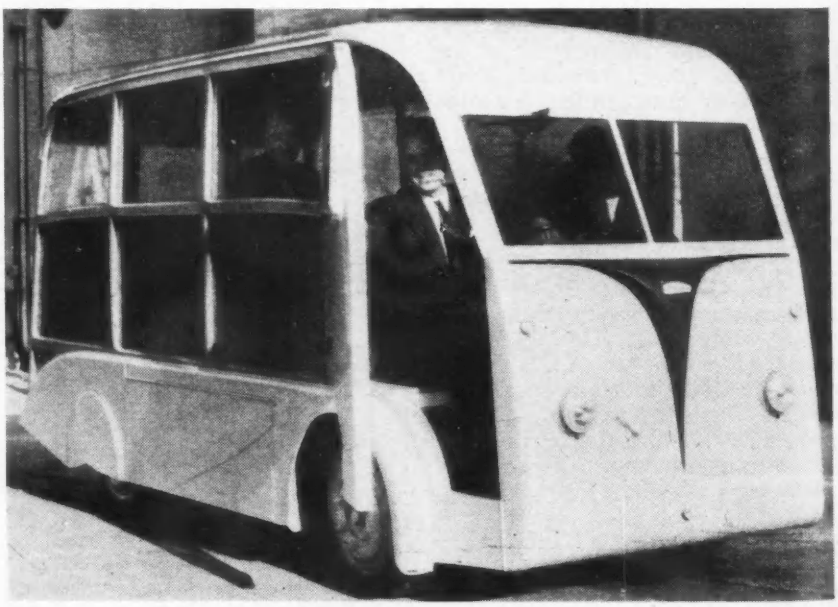
According to the Jessop Steel Co., Washington, Pa., two of the larger car manufacturers will be using automobile bumpers made from Jessop stainless-clad steel on their 1948 car and truck models.

Joseph L. Trecker

Joseph L. Trecker, 45, president of the Kearney & Trecker Corp., Milwaukee, died suddenly on October 7.

Report New Cortez Car Has 100 in. Wheelbase

Additional information on the new Cortez automobile to be manufactured by North American Motors, Inc., is that the car will have a 100 in. wheelbase, and will come with radio and heater as standard equipment. Selling price is said to be in the neighborhood of $1100 for the two-door sedan which will be the first body type to be built. Initial production will have the conventional chassis, but plans for the future include frameless type body and an entirely new engine said to be much more efficient than the present six-cyl type. Meanwhile, either Continental or Hercules engines, or pos-



British Combine photo

Needs No Gasoline

This electric estate wagonette, produced by the Brush Electrical Co., Loughborough, England, is a possible answer to the British gasoline ban. Weighing 2800 lb and seating 12, with luggage, the wagonette has a 40 mi range, with one battery charge, and travels 20 mph. The price is £1380.

sibly both, will be used in early production. Designer of the car and president of the company is John T. Tjaarda, formerly chief designer for Briggs.

Motor Vehicle Taxes Up 41 Per Cent Over 1946

The National Highways Users Conference reports that up to Sept. 1 of this year highway users paid 41 per cent more federal automotive excise taxes than during the same period last year. For the first eight months of 1947 truck excise taxes showed an increase of 93.2 per cent over the same period of 1946.

Magnaflux Conference On Production Inspection

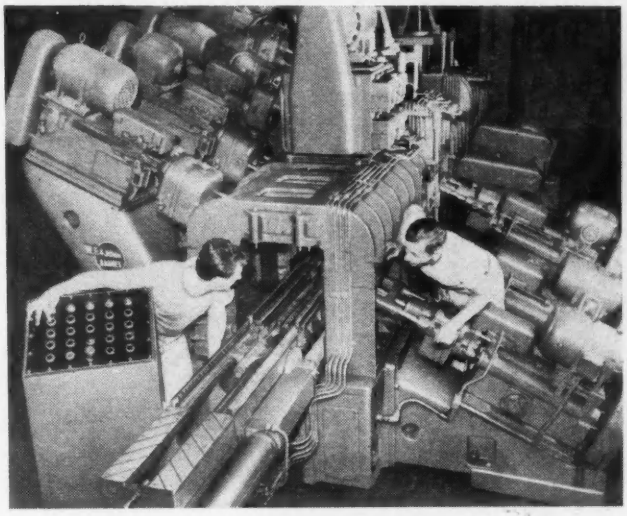
Sponsored by the Magnaflux Corp., a national conference on production inspection with Magnaflux and Zyglo will be held in Detroit, Nov. 10-11. The program includes specific inspection of forgings, castings and process control inspection.

Elect E. G. Bailey President of ASME

E. G. Bailey, vice president, The Babcock and Wilcox Co., N. Y., was recently elected as the next national president of The American Society of Mechanical Engineers. He will assume office at the end of the 1947 Annual Meeting, which will be held in Atlantic City, December 1-5.

New Car Style Trend Requires More Steel

The coming trend in automotive styling, such as typified by Packard, Kaiser-Frazer and Studebaker may have an adverse effect on automobile production as long as the steel shortage continues. Packard reports that its 1948 model takes an average of about 150 lb more steel a car than its predecessor. The added amount of steel required would have to be offset by an increase of possibly five per cent in supply. An exception is reported in the case of Ford. A company spokesman says the 1948 model will require less steel than current models. One source says the car will take as much as 200 lb less steel, due in some measure probably to substitution of aluminum in certain parts.



Drilling Super-Sixes

Part of Hudson Motor Car Co.'s $16 million reconversion program, this new W. F. & John Barnes multiple drilling machine, is helping to speed production of the new Super-Six engine. Eight engine blocks are continuously carried through the machine and hydraulically raised and lowered into position for each machining operation.

Labor

GM Gives Raise of 5 Cents Hourly to Remedy Inequities

General Motors has granted a pay increase of five cents an hour to approximately 15,000 skilled maintenance workers. GM said the increases were made to correct inequities which developed in some classifications as a result of directive orders issued by the National War Labor Board.

Bundy Tubing Incentive Plan Still Working Successfully

A progress report by Wendell W. Anderson, president of Bundy Tubing Co., indicates that the company's costs savings sharing plan has been eminently successful. Mr. Anderson listed the following results since the plan became effective on April 1, 1946: a production increase of 35 per cent; a reduction in absenteeism of 43.9 per cent; a decrease of 41 per cent in time spent on grievances; a decrease in labor turnover of 43.5 per cent; 16 per cent less scrap; and a large increase in the number of employee suggestions submitted for improving production. He also revealed that during the six quarterly periods since the plan began, employees averaged .2381 cents in extra earnings per hour for every hour worked. Each employee who worked the full scheduled hours during the period averaged $713 in extra pay. He added that the greatest tangible benefit of the plan has been the upsurge in morale of workers.

Continental Motors Corp. Shows Profit Since July

Although Continental Motors Corp. reported a net loss of $54,779 for the quarter ended July 31, operations have been in the black commencing with July and should show continuous improvement, according to C. J. Reese, president.

Metals

Copper

Current record consumption by wire mills combined with larger tonnages requested by brass mills is contributing to the current strong copper market. There is no change in the 21.50¢ price as the recent freight rate increase is being absorbed by the producers.

Zinc

Demand for zinc has improved since the summer slack period; demand for Prime Western and Special High Grade is particularly good, and a continuing healthy market is predicted by industry observers.

Lead

A neat balance in supply and demand has been achieved in the lead market, although there is continuing high demand, consumers are able to obtain full requirements. In fact, there isn't a ripple in the market structure as there is no surplus tonnage left after shipment to consumers.

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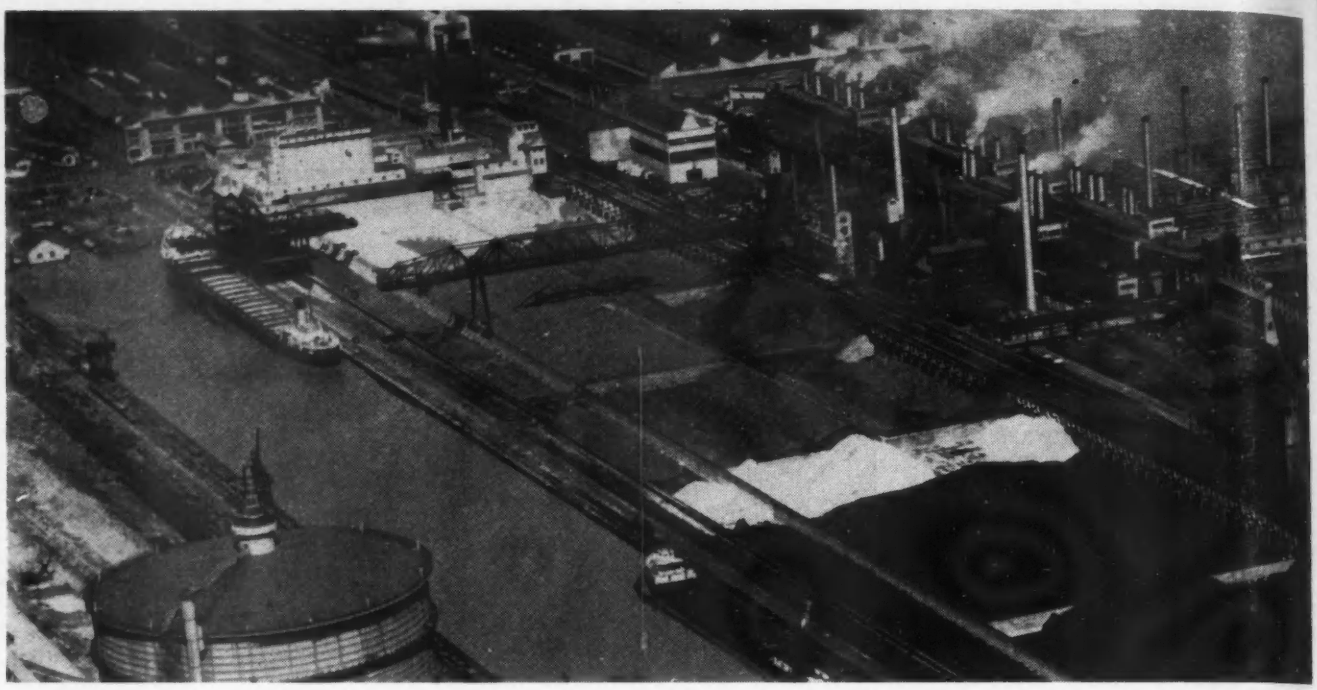


Ford Modernizes Its Buying

By Albert J. Browning

Vice President and Director
of Purchases, Ford Motor Co.

WE IN purchasing at the Ford Motor Co. are a service group, serving the production, engineering and operating activities of our company and it is our job to get the materials, parts and supplies those activities require in the right quantities, of specified quality, delivered at the right time and at an economical cost to the company. Just like the other operating units, purchasing entered the postwar period with a reconversion problem. With the belief that the organization of our division could be improved both as to simplicity of operation and directness of method, we began a critical and analytical study of our activities in June of 1946. A team composed of two men from a management consulting firm and three of our own men worked with me for several months studying our past and present operating procedures and from this study made up a list of weaknesses and faults in our system and then developed a plan for correcting them.

As a result of this study we set up those staff and service departments needed to provide essential services, policy and control assistance as follows: We organized a Commodity Research Department to provide both short-term and long-range information on basic commodities such as steel, copper, lead, etc. A Purchase Analysis Department was included to help our buying departments on product and price analysis. This included compiling data on price and cost trends and analysis; getting information about suppliers financial position and earnings; analyzing products and manufacturing processes with a view to aiding buyers and suppliers in reducing their costs without reducing suppliers' profits below a reasonable level; preparing information about cost accounting methods; and making analyses of parts and attempting to simplify and substitute less critical materials.

It was felt that an Administrative Control Department providing control data and reports and assisting in improving organization and methods on a continuing basis would be of value. And after careful study, a Central Follow-up Department to schedule, release and follow-up shipments by suppliers to branch plants was established. To handle the flow of papers and materials from other company units; to act as a clearing point for exchange of information; and to provide normal office services for purchasing, a service group was formed and called Procurement Services Department.

In the buying section of our organization we made some changes. We divided the management and supervisory load on the Director by providing for two purchasing agents to coordinate the buying groups; one for production parts and one for non-productive mate-

Methods

rials. Next, the 10 buying divisions were condensed into seven departments and items were reassigned into a more logical grouping. Each of the heads of these seven buying departments was provided with a small staff of administrative personnel and purchase analysts to assist him and the buyers. With the framework of the organization established, we were able to reassign personnel in accordance with skills and needs and where necessary to recruit additional personnel to fill those jobs which could not be filled from within the organization.

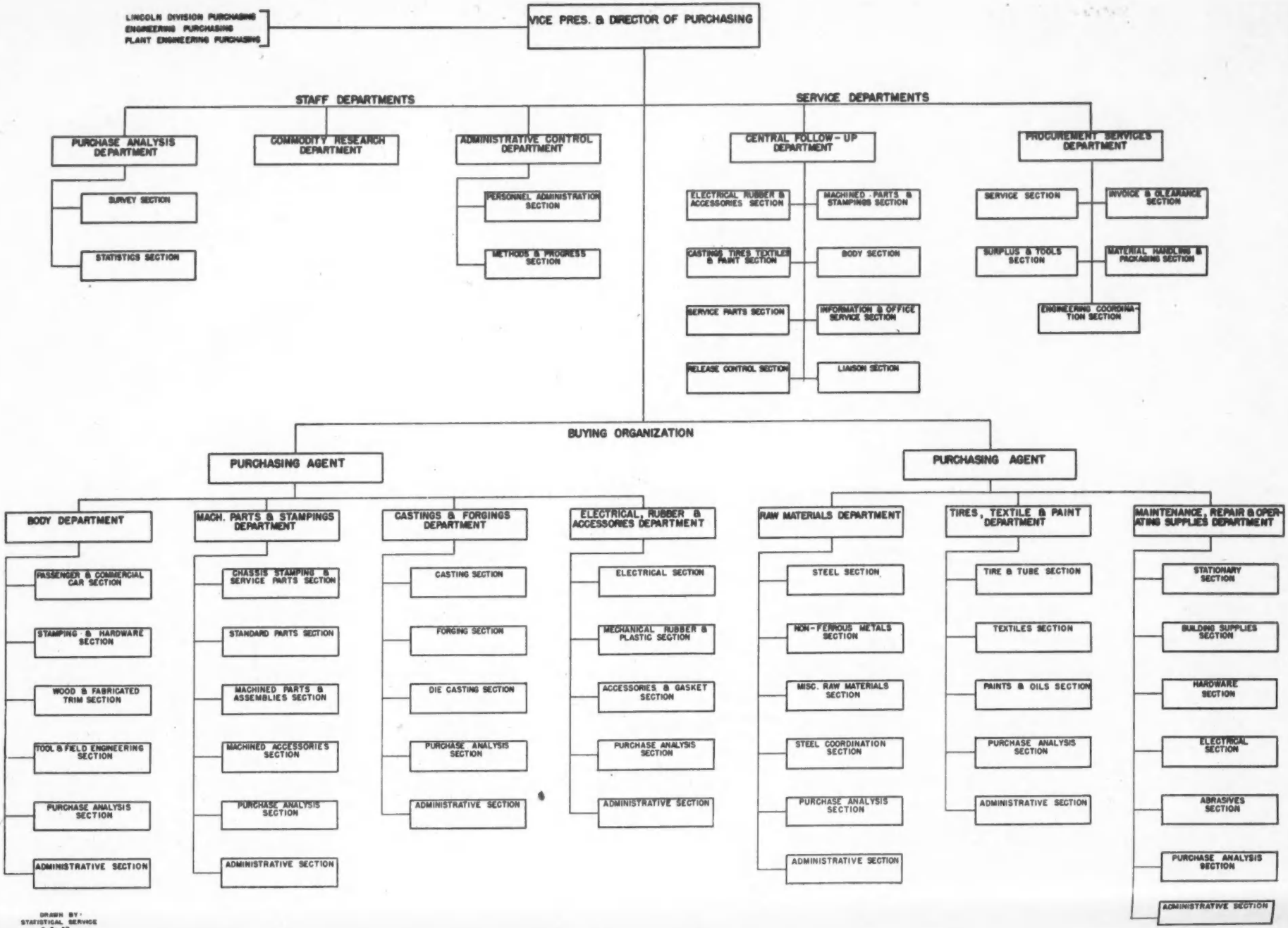
Solving Materials Shortage Problems

Briefly, here are some of the results of our first year of operation: Commodity Research Department has kept buyers up-to-date on commodity trends—both as to supply and price on a short and a long-term basis. Buyers now receive a comprehensive analysis of materials and information gathered from a variety of sources and presented in usable form. Several studies have been made of basic commodities such as steel, lead and copper. We have used the recommendations as guides in making commitments for our requirements with excellent results. This department also surveys industries of importance to our company for the purpose of recommending expansion or contraction of Ford's direct interest in production of such things as steel, die castings, by-products, etc.

Our commodity research men are not right all the time, but their advice is valuable and helpful. They have just completed another study of the steel picture which indicates that the steel supply could be tight for some time to come. This means we'll have to take some drastic steps if we are to produce more cars in 1948. There are two ways we can increase our production in 1948. One—is to get more steel. But it doesn't seem likely that there will be much more available unless the demand for steel drops. The second—is to use less steel in each car by substituting other materials for steel wherever possible. Each buyer, assisted by his purchase analysts, is working closely with suppliers on this problem and we are beginning to get results. We developed one substitution as a result of a strike in one of our supplier's plants. We had been using a steel running board with a rubber covering bonded to the metal. The plant which supplied us was shutdown due to a strike and we faced a shutdown of our assembly plants. The president of one of the large aluminum companies was in my office when the situation became critical and during our talks the possibility of using aluminum was discussed. It was tried—and as a result we have a better looking and wearing running board at less cost. We saved eighteen pounds of steel per car and we also reduced the deadweight of the car by fifteen pounds. Substituting aluminum for steel on headlamp housings cut the cost of this part, gave us rust-proof housings, and saved three pounds of steel per car. We're working on a number of similar projects and our aluminum suppliers claim that we can reduce our steel requirements by at least 200 pounds per car. If we could do this it would mean about 100,000 more cars could be produced from our present steel supply—a gain in sales of over 100 million dollars per year—but this is possible only if we can do it.

Some substitutions are of course not economical

CHART OF FORD'S MODERNIZED PURCHASING DIVISION



from a parts-cost standpoint and when steel is once more available in adequate quantities, we will again, in such cases, use that metal. However, with a possibility of producing 100,000 more cars by substitution, you can understand our willingness to consider substitutions even at somewhat higher cost.

Analyses of Vendors Operations

Our Purchase Analysis Department also provides a service to the buyers in the form of analyses of vendors' operations, including the review and interpretation of financial statements and related operating data from various financial publications, and the preparation of brief and concise reports of that data. The department also studies periodic reports of vendors' operations, and buyers are promptly advised of significant trends or changes.

One example of how this works is evident in a recent case. A request for a substantial price increase was made several months ago by a supplier. An analysis of this suppliers operations as compared with those of a second supplier—a competitor—showed an unfavorable profit position for the first company, although efficiency of these two companies was known to be comparable. Investigation disclosed that the first supplier was incurring losses in operations other than production for Ford. The second supplier stated that he was not planning to increase his price, and was given a larger share of our requirements. Shortly thereafter the first company voluntarily withdrew its price increase and has agreed to hold his prices for the remainder of 1947. The estimated saving resulting from this negotiation exceeds $300,000 per year.

The Purchase Analysis Department also provides a service to the buyers by conducting cost comparisons of two or more suppliers and of Ford manufacturing costs, compared with suppliers costs for the purpose of determining where economics, or improvements in efficiency of production methods could be made. These studies are made only in instances where the vendors are mutually cooperative and are desirous of benefiting from the results.

Continuous studies of cost and price relationships between "make" and "buy" items are made to assist buyers in negotiations with suppliers, in determining validity of prices quoted, and to assist suppliers by pointing up elements of costs which are in excess of Ford costs, thereby assisting suppliers in keeping theirs at a minimum. Studies of new-type products to ascertain whether or not savings will result from their adoption are another job of the department. One example is the study of speed nut fasteners. This study served as a guide to decisions which will result in savings to the company in excess of three million dollars a year.

Chart Price Changes and Trends

Another function of the Purchase Analysis Department is the spot review of all price changes and movements, calling the buyers attention to changes or trends inconsistent with general patterns and working with the buyers in investigating requests for unusual price increases. In addition to direct and tangible savings, many indirect benefits have also resulted from this activity.

In addition to these specific functions, the Purchase Analysis group compiles data and reports and brings attention to pertinent information about price patterns. It also acts as a clearing point for the preparation of cost and price information required of the Purchasing Division by other company units.

Some other interesting results have been accomplished recently. For example: In analyzing the price quoted for the steering gear housing by a supplier, we found that they paid 98 cents for a rough malleable casting and we bought the same casting for 63 cents. Arrangements were made for the supplier to purchase at our price, a reduction of 35 cents per unit.

A comparison of material costs for steel wheel assemblies and of steel blank sizes showed that our Hamilton Plant used heavier stock than a supplier. By changing the size of steel used, we reduced our cost of manufacture by three cents per wheel. A change in paint spraying technique saved an additional one cent a wheel. The supplier has also suggested a design change on the rim which has been approved by engineering with an estimated annual saving of some $64,000. It works both ways, for the vendor as well as for the company.

A simple change in design of the 1947 steering wheel reduced costs by 19 cents and gave us a more attractive wheel. Elimination of two slots on the hand crank ratchet made it possible to change production methods and materials with a saving of three cents per car. We expect that activities of this kind will save the company a total of at least 10 million dollars a year.

Monthly Progress Reports

The Administrative Control Department which was established as part of our new organization, has developed a monthly progress report which keeps the department heads, the buyers, and myself informed as to how well we are doing on one hand and where we fall below standard on the other. We study this report carefully and our buyers are very conscious of any item shown as being behind schedule. This department has also helped us greatly by simplifying our purchase order and releasing procedures to the point where our paper work load has decreased substantially. They also work with department heads on their organization, procedure and personnel problems.

The Procurement Services Department and Central Follow-up Department have relieved the buying organization of much of the detail work and thereby release more of the buyers' time for negotiations and give them an opportunity to learn more about suppliers' capacity, operations and methods.

The staff and service departments so far considered are service agencies only. The heads of the buying departments—whom we call assistant purchasing agents—have full and complete responsibility for buying and for dealing with our suppliers. The staff groups do not negotiate with suppliers and do not supervise or issue instructions to the buyers. The buyers, under the supervision of the Assistant Pur-

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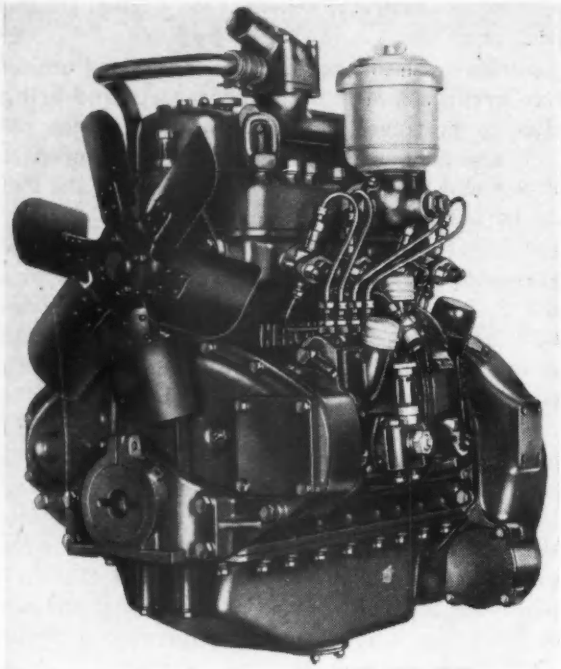
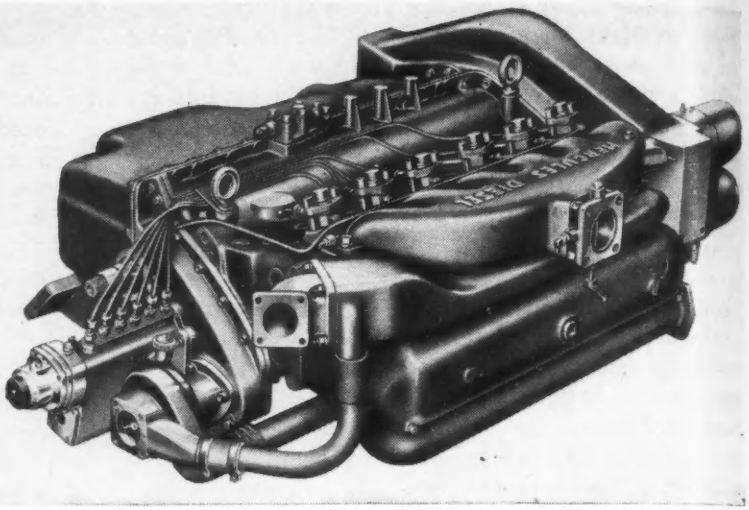




(Above) Model DWXLDF, one of the flat Diesels just introduced by Hercules, has a piston displacement of 426 cu in. and a maximum output of 142 hp. It weighs 1300 lb.

(Left) This new Hercules Model DIX-4, a four-cylinder Diesel, is built in two bore sizes, developing 46½ hp and 57 hp

Hercules Adds Six Diesels and Two Gasoline Engines

HERCULES Motors Corp. has completed the development of a number of engines in the past year, both Diesel and gasoline, of particular interest to manufacturers of mobile equipment. In the Diesel class the company has added six models to its line. These engines, like the entire nine series and 22 models of Diesels it builds, are of the high speed, light weight, heavy duty type with smoothness of operation and economy fully substantiated in the field.

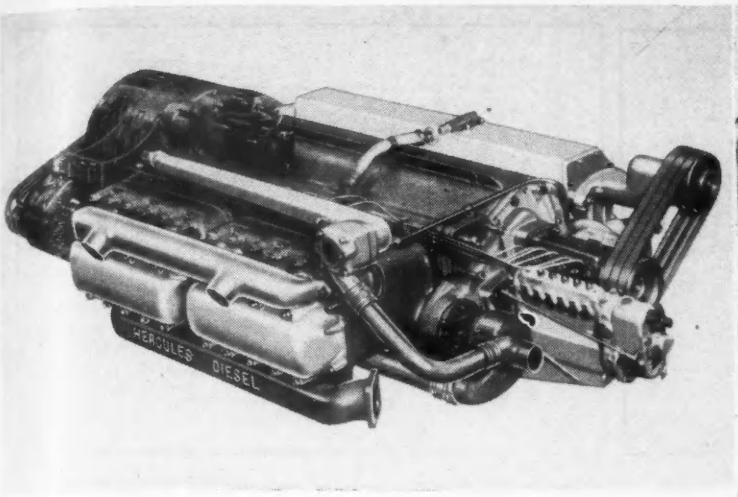
The Hercules Model DIX-6 is a small six-cylinder Diesel with a 3⅝ in. bore and 4 in. stroke. This engine is capable of operating successfully at speeds up to 3000 rpm. The stripped engine develops 93 hp and only weighs approximately 750 lb. Because of its low weight, plus the fact that its over-all dimensions are approximately those of the gasoline engines of similar displacement, Hercules states that conversions can be readily made without fear of any compromise in performance and operating characteristic of the engine.

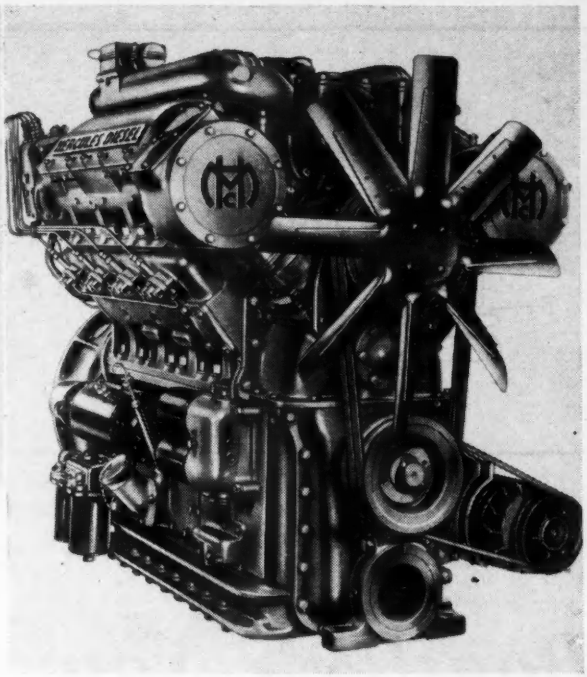
The Hercules Model DIX-4 is a four-cylinder Diesel engine that parallels the model DIX-6 as described above in design, performance features, and in its interchangeability with gasoline engines of similar power capacity. This four-cylinder engine is built in two different bore sizes. The 3¼ in. bore and 4 in. stroke engine develops 46½ hp at 3000 rpm. The 3⅝ in. bore and 4 in. stroke engine has a power output of 57 hp at 3000 rpm. The stripped engines weigh ap-

Major Specifications of Hercules Engines

Engine Model	No. of Cylinders	Bore and Stroke (in.)	Displacement (cu in.)	Max. hp at rpm	Approx. Weight (lb.) Stripped
Gasoline:					
TDXB	6	4⅝x5¼	474	160–2600	1345
RXLDH	6	4¾x5¼	558	180–2600	1470
Diesel:					
DIX-4	4	3¼x4	133	46–3000	600
		3⅝x4	165	57–3000	600
DIX-6	6	3⅝x4	220	93–3000	750
DJXHF	6	3¾x4½	298	99–2600	900
DWXLDF	6	4¼x5	426	142–2600	1300
DFXHF	6	5¾x6	935	260–2100	2600
DNX-V8B	8	5¾x6	1247	340–2100	4200
DNX-V8C	8	6x6	1348	365–2100	4200
DNX-V8D	8	6¼x5	1468	400–2100	4200
DNX-V8D*	8	6¼x5	1468	500–2100	4600

* Supercharged.

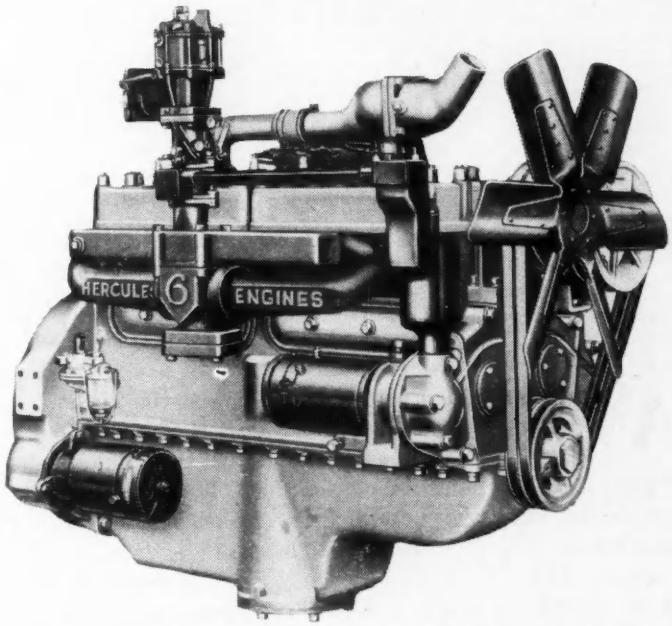




(Above) Here is Hercules Model DFXHF, a flat Diesel of 935 cu in. displacement, 260 hp, and weighing 2600 lb.

(Right) This Hercules V-8 Diesel is available in three sizes of 1247, 1348 and 1468 cu in.

to Its Line



Hercules' new six-cylinder gasoline engine, Model RXLDH shown here has an output of 180 hp.

proximately 600 lb. Well balanced, counterweighted crankshafts supported in five main bearings insure smooth operation even at these comparatively high speeds.

While Hercules Motors Corp. sensed the postwar trend for the pancake type of engines as far back as 1938 for under-floor, midship installation, and built a number of them since that time, it was not until the past year that the opportunity presented itself to round out the Hercules line. Three models of flat six-cylinder Diesel engines have now been developed.

The Hercules Model DJXHF horizontal engine develops 99 hp maximum power at 2600 rpm. The stripped engine weighs approximately 900 lb. It has a 3¾ in. bore and 4½ in. stroke, giving a total piston displacement of 298 cu in. Model DWXLDF horizontal engine develops 142 hp at 2600 rpm and weighs approximately 1300 lb (stripped). Its piston displacement is 426 cu in., bore 4¼ in. and stroke five in. Model DFXHF develops 260 hp at 2100 rpm, having a total piston displacement of 935 cu in. with a 5¾ in. bore and six in. stroke. The stripped engine weighs approximately 2600 lb. These three pancake type engines are said to be the lightest and most compact engines of this type on the market.

Last year Hercules introduced Model DNX-V8, an eight-cylinder Diesel, and is now in a position to furnish a range of power in the Diesel class from 12 to 500 hp. The Hercules DNX-V8 is a 45 deg V engine. It is not new to Hercules in the strict sense of the word since it is the commercial outgrowth of a 32-cylinder engine Hercules built for the United States Navy during the war and which, at that time, went through exhaustive tests and proved sound in design, principle of operation and construction. The Model DNX-V8 is built in three sizes, specifications of which are given in the accompanying table.

The Hercules Model DNX-V8 Diesel is compactly

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Engineering Library

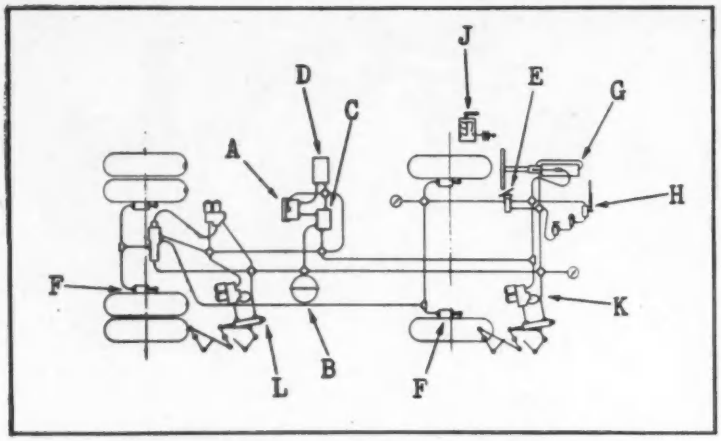

Fig. 1 — Main components of the Bendix hydraulic system are shown in this diagram

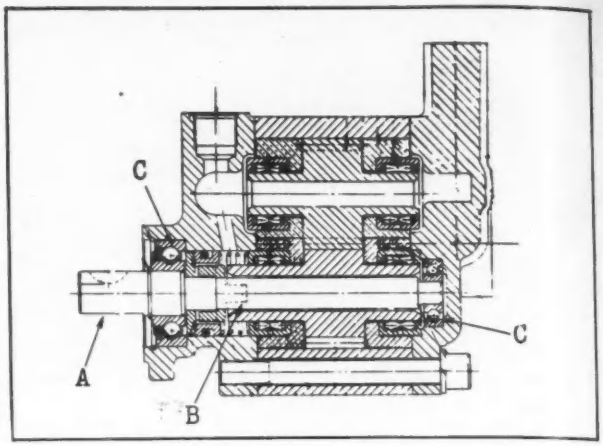

Fig. 2—Sectional assembly view of the complete pump

Bendix's New Hydraulic System for Commercial

Equipment for Power Operation of Brakes, Steering, Windshield Wiper, Doors and Throttle Now Undergoing Road Tests on Bus

AN EXPERIMENTAL hydraulic system for the power operation of all control functions in commercial vehicles has been developed by the Bendix Products Div. of Bendix Aviation Corp. This hydraulic equipment, nearly all of which is of new design, has been installed on a transit-type 35-passenger bus, and is now undergoing thorough road tests. The durability of the hydraulic equipment and its operation without special service attention have currently proved up to all expectations.

The principal components in this circuit, shown in Fig. 1, are the pump A, accumulater B, pressure regulator C, reservoir D, brake control valve E, brake operating cylinders F, power steering gear G, windshield wiper H, door controller J, valves K, and operating cylinders L. The pump, a sectional assembly view of which is shown in Fig. 2, is an involute gear type with a theoretical displacement of 1¼ cu in. per rev. It is built of cast iron as are the other units, and it weighs 15 lb. This pump is driven at approximately engine crankshaft speed. As shown in Fig. 2, quill A and coupling B are provided with independent bearings C to permit an over-hung belt and pulley drive or direct-coupled engagement. Installed within the rear end plate is a relief valve set somewhat above the normal pressure range which is determined by the regulator valve.

The pump performance is shown in Fig. 3 throughout a speed range of 500 to 3000 rpm and at a pressure of 1000 psi. The over-all efficiency varies from 70 per cent at engine idling speed to 76 per cent at 3000 rpm, the latter being considered above average top speed for bus engines. Within these same speeds and pressure, the pump flow varies from two gpm to 15 gpm, and the power input ranges from two to nearly 12 hp.

The direction of pump flow and its pressure are determined by a regulator valve shown in the photo in Fig. 4. The weight of this unit is six lb, and in this installation it is adjusted to maintain system pressure between 800 and 1000 psi. A sectional view of the regulator is shown in Fig. 5. In the position shown it will direct oil through the check valve A to the accumulator until maximum pressure is attained. At this point, the pilot valve B will have moved to the left, closing the high-pressure passage and opening the low-pressure or reservoir passage C. The cut-off valve D will then open the return port E, the check valve will seat, sealing the accumulator supply, and the pump discharge will flow to the reservoir under a nominal head. Thus, the power absorbed by the pump will be quite small until the accumulator is again drained to 800 psi and the regulator momentarily recycles.

The accumulator, a 10 in. sphere weighing 20 lb,

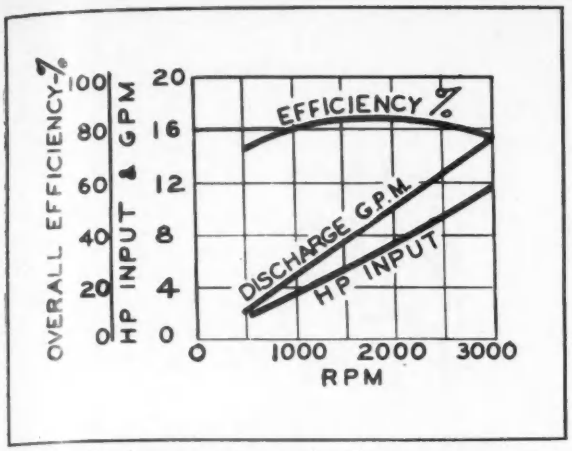

Fig. 3—Performance curves for the gear pump operating at a pressure of 1000 psi with Univis No. 47 oil at temp of 120 F.

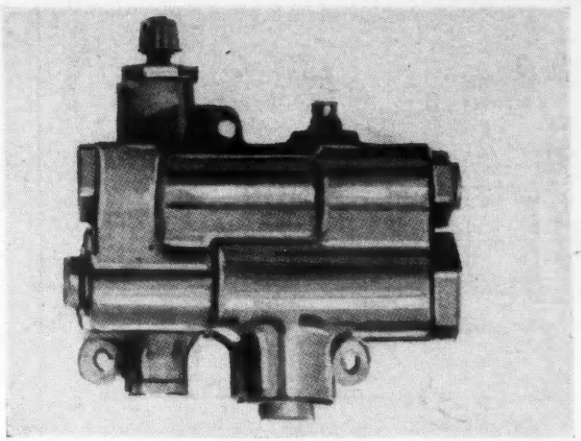

Fig. 4—Regulator valve

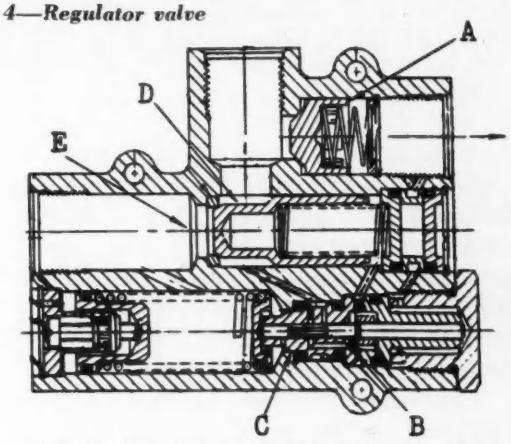

Fig. 5—Sectional drawing of the regulator valve

By George W. Pontius Bendix Products Div., Bendix Aviation Corp.

Vehicles

is the one production unit in the system. It was developed by the Pacific Div., Bendix Aviation Corp., for aircraft installation, and has proved well suited. Main element in this device is a bladder enclosed in a steel shell which consists of two hemispheres welded together at their equator. An air inlet valve is provided at one pole and an oil supply port at the opposite pole. The curves in Fig. 6 show pressure plotted against discharge for varying initial air charge pressures. Approximately 450 psi is used which provides 56 cu in. discharge between the regulated range of 800-1000 psi. However, it will be seen that a volume of 190 cu in. is obtainable down to 500 psi. Since there is quite effective braking at this pressure, it is possible, in the event of failure in pump supply, to make from 36 to 9 brake applications depending upon slack

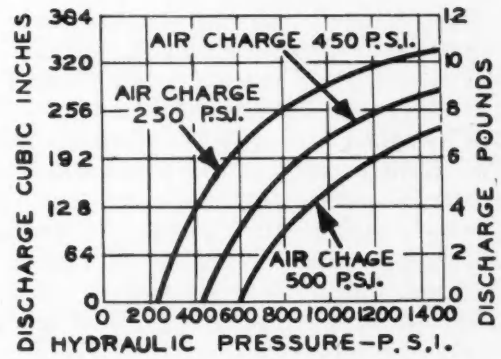

Fig. 6—Operating characteristics of the accumulator are shown by these curves.

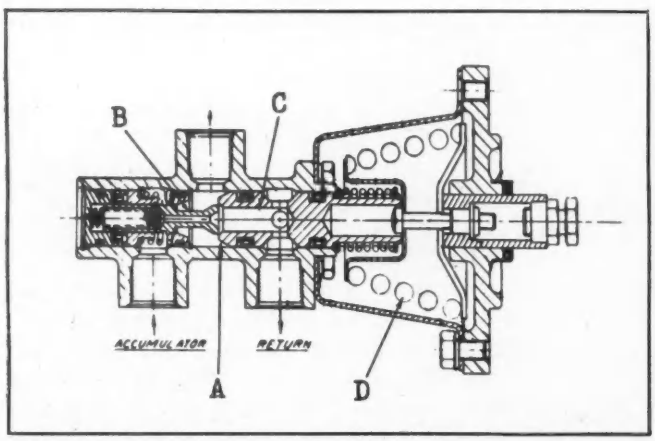

Fig. 8—Sectional view of the brake pressure control valve

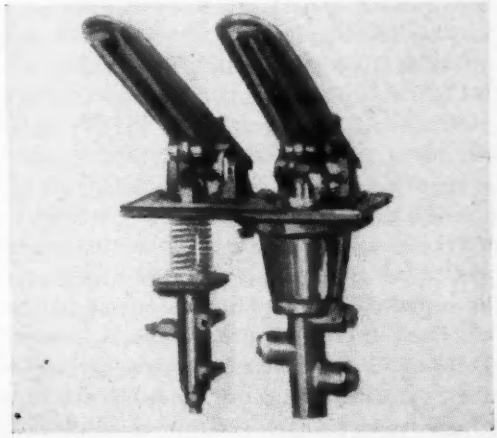

Fig. 7—Treadle cluster assembly. The brake pressure control valve is shown at the right, and the hydraulic throttle control at the left

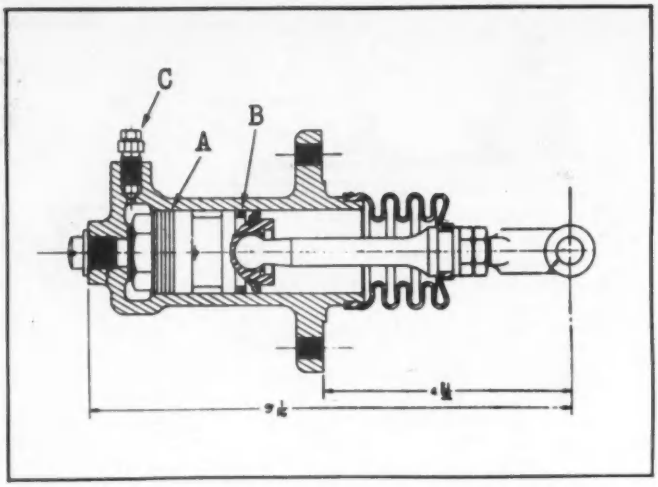

Fig. 9—(Right) Sectional drawing of a brake cylinder

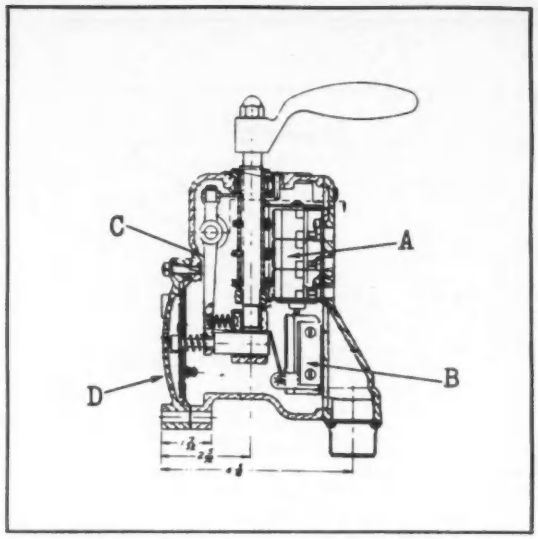

Fig. 10—Door operating controller

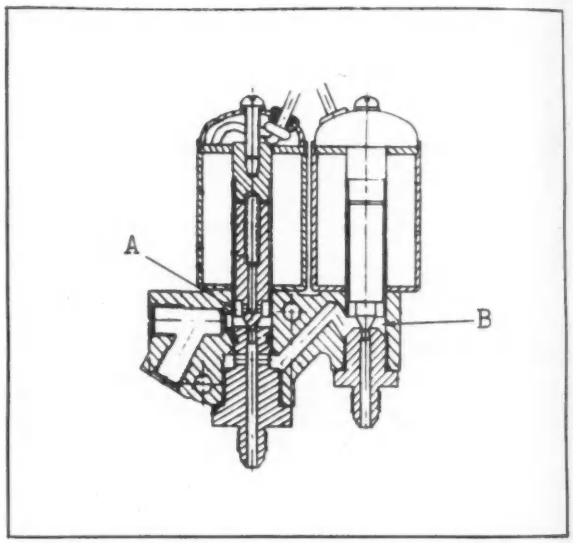

Fig. 11—Solenoid valves for door operating system

adjustment.

The oil reservoir and filter are combined in the interest of cost reduction, although they may be installed separately if preferred or if there is a problem in finding adequate installation space. The weight of this unit is 23 lb. The method of mounting the filter permits convenient removal for cleaning or replacement. The cartridge end plates are held in place by a compression spring which releases when the reservoir head is removed by loosening a single cap screw. A filler screen and vent fitter are provided to help in keeping the oil clean.

The function usually considered of first importance in bus power systems is braking. In this installation, the pressure control valve for brake control is mounted vertically on a circular flange under the floor board and connected to the treadle in a conventional manner. This valve is shown in Fig. 7 installed in the treadle cluster assembly. This photo also shows a hydraulic throttle control which is not connected with the power hydraulic circuit. It consists of master and slave cylinders which, connected with a single line and reservoir, comprise a foot-operated hydraulic force and motion transmitter.

A sectional view of the brake valve in its released position appears in Fig. 8. The inlet valve is normally closed, and it is designed to be balanced in any position. A valve of this type is advantageous because it will minimize hysteresis which is detrimental to fine control. That is, approximately the same brake cylinder pressure will exist for a given treadle position whether that position be attained when the pedal is being depressed or released. When the treadle is depressed, the normally open valve A is first seated, closing the return passage. Further movement opens the inlet valve B allowing flow from the accumulator to the brake cylinder and, as pressure in the brake system rises, there is a proportionate increase in treadle reaction. This reaction, commonly referred to as "feel," is determined by the difference in areas of the return valve plunger C and the inlet valve, and may be varied without change in the valve flow characteristics. The position sense in the treadle is determined by the spring D between the valve plunger and treadle plunger. When the treadle is released, the inlet valve seats and the return valve unseats, permitting fluid in the brake system to return to the reservoir.

The brake cylinders are externally mounted and engaged to levers which are keyed to the brake camshaft in the conventional manner. On the front brakes, cylinders of 1½ in. bore and two in. stroke are used; the rear brake cylinders have a two in. bore and two in. stroke. These units are similar in appearance. The weight of the rear cylinder is 4½ lb, and the front cylinder weight is 3½ lb. Fig. 9 is a sectional view which is typical of both units. The piston rod swivels in a ball socket to permit a flange mounting with four cap screws. The primary seal A is chevrons, and the secondary seal B is an O ring. A conventional bleeder screw C is used to purge the system of air. With these cylinder sizes, it has been found that the wheels will slide at line pressures between 650-700 psi under full load conditions. In making a brake application of this nature, it has been found that the lag from the

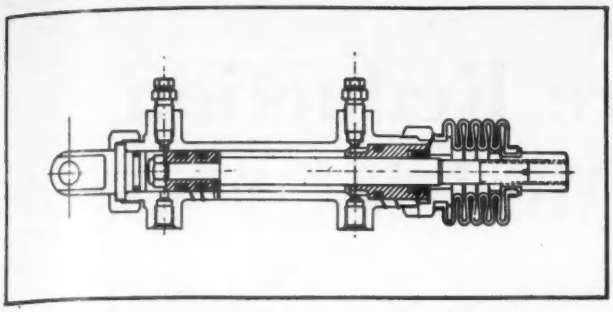

Fig. 12—Sectional view of the door motor

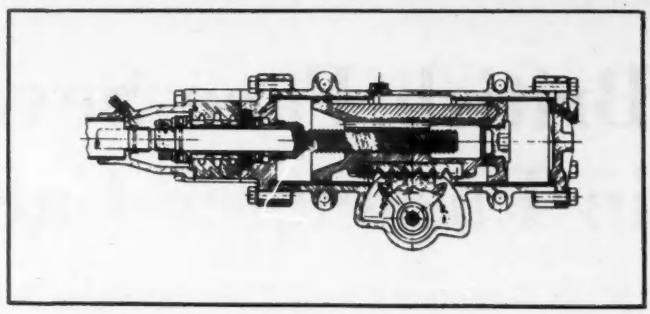

Fig. 14—Experimental steering gear assembly

time the operator's foot touches the treadle until pressure mentioned is attained amounts to approximately 0.2 sec. Brake release is accomplished in a little less time than that required for application.

Electrical control and hydraulic actuation are combined to the door operating system to simplify plumbing. A section view of this controller is shown in Fig. 10. The housing is of three-piece construction to facilitate adjustment and replacement of switches. The center body is tapped for mounting with the control shaft vertical and the handle motion in a horizontal plane. One single-pole double-throw switch A is provided for each door and the brake over-rule valve, and a fourth switch B, single-pole single-throw, is installed in series with the selector switches. The last-mentioned switch is applied by a cam-operator lever C when the handle is placed at any one of the four stations, and is released by a diaphragm dash-pot D. The dash-pot delay may be varied by adjustment of a needle valve; however, the time element is not critical, since it need only safely exceed the time required to open or close the doors. For example, the door operating time is never more than a second, so the time-delay is set for four seconds, which allows a wide margin for the possibility of erratic operation. When the controller handle is moved forward to the first detent, the front door opens. When advanced to the secon detent, both doors are open. When the handle is moved forward to the first detent, the rear door opens first; when placed rear-ward to the second detent, both doors are open.

The solenoid valves are identical for each door. The weight of this valve, including solenoids, is 2¼ pounds. The internal construction of this unit is shown in Fig. 11. A poppet is formed on each armature, and both are normally seated. Accumulator pressure is permitted within the core, since the sleeve, pole piece and body are brazed together, forming a pressure-tight assembly. This design offers a simple and glandless valve which has thus far proved to be a dependable unit.

The door motor, a double-acting cylinder having a ¾ in. bore and three in. stroke and weighing 2¾ lb, is shown in the sectional drawing of Fig. 12. The piston rod area is approximately half the piston area. Accumulator pressure, acting on the annulus formed by both members, is present in this end of the cylinder at all times. With the piston position shown, the door is held in a firmly closed position. Since the opposite end of the piston has twice the area, an equal pressure on both ends of the cylinder will cause the piston rod to extend with a force equal to its retracting force when the larger chamber is connected to the reservoir. When the left hand solenoid is emergized, the poppet A opens, admitting fluid pressure into the large end of the door cylinder, causing the piston rod to extend and the door to open. When the controller is returned to neutral, the second solenoid is energized, opening the return valve poppot B, and simultaneously the first solenoid is de-energized, permitting its valve to cut off accumulator supply. The door then closes, and when the controller dash-pot fully returns, power supply to the control switches is interrupted, the second solenoid is de-energized, and its valve is seated.

The brake over-rule valve, shown in a released position in the sectional drawing of Fig. 13, serves to hold the rear wheel brakes applied so long as the bus doors are open. It is connected in the pressure supply line from the brake regulator to rear brakes, and flow occurs through this passage whenever brakes are normally applied. The accumulator is directly connected to the port A in the left-hand end, and is connected to the port B in the opposite end through a solenoid valve similar to the one described for door operation. When the door controller handle is placed in any one of its four positions, the brake over-rule switch energizes this solenoid valve, admitting

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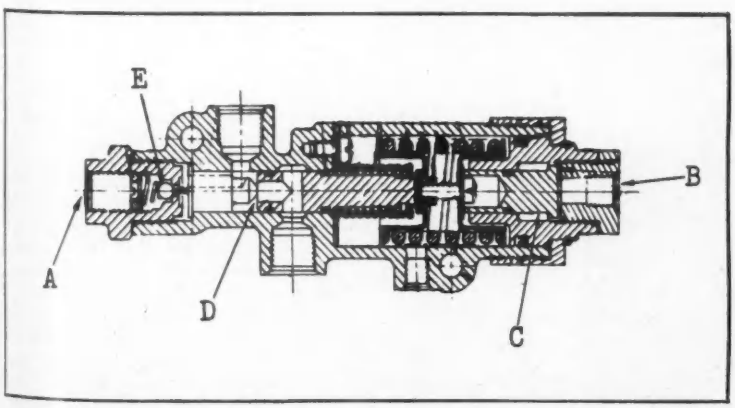

Fig. 13—Brake over-rule valve is shown here in a released position

British Face Severe Reduction in Passenger Car Models

Austin Replaces Three Models with the A-40 Car, Lea Francis Announces New Sports Roadster and Humber Introduces 1948 Five-Passenger Hawk

By W. F. Bradley
Special European Correspondent for AUTOMOTIVE INDUSTRIES

THE number of different British car models now in production can be reduced to 42 within the next 18 months, according to a report submitted by the Society of Motor Manufacturers and Traders to the Ministry of Supply. This represents a reduction of 70 per cent as compared to the number of types manufactured in the United Kingdom in 1939 when there were 136 different models in production. They now number 62, and if the manufacturers' suggestions are adopted, they will drop to 42 by 1949. The six big manufacturers, producing nine-tenths of Britian's total, plan to drop from 30 to 21 models.

The Government suggestion is that only one model per factory shall be produced. This is opposed by the manufacturers, who point out that any sudden change in production programs will entail scrapping of expensive equipment and would have the immediate effect of lowering production.

At the present time the home market is being starved in favor of export. It is estimated that 160,000 cars will be required for the essential home market during

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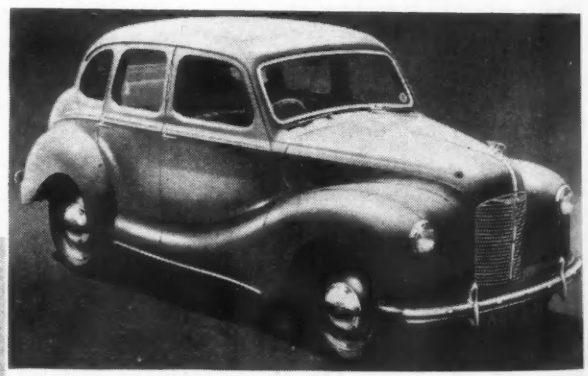
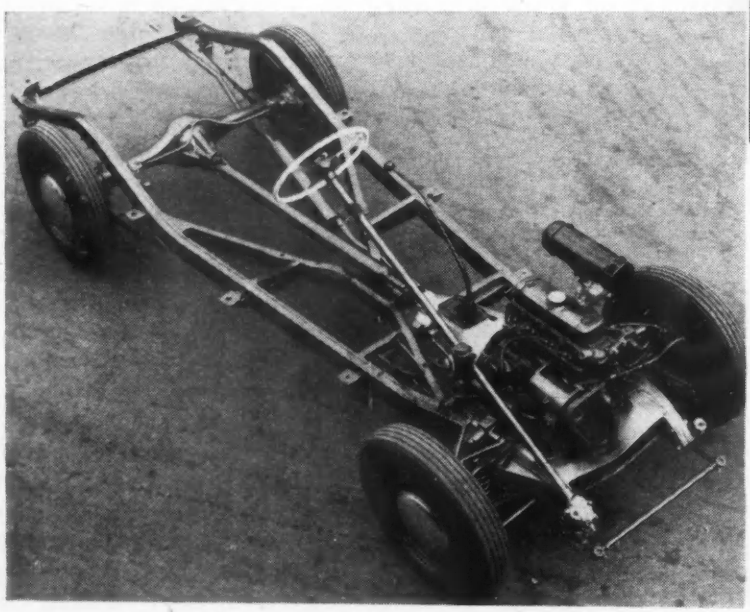
Details of the independent front suspension adopted for first time by Austin on the model A-40. The arms are mounted on rubber bushings with shoulders to take thrust loads. Double-acting hydraulic shock absorbers are provided.





Innovations in the new Austin A-40 model, as shown in this chassis photo, include independent front-wheel suspension with coil springs and a front mounting of the steering gear, which has a variable ratio —11 to 1 straight ahead and 14 to 1 on full lock. The welded pressed steel frame has full length box-section side members, box-section cross members and diagonal cross bracing. The 73.17 cu in. engine has a 2.578 in. bore and 3.50 in. stroke, and operates at a compression ratio of 7.2 to 1. It develops 40 bhp at 4300 rpm and 59 lb-ft maximum torque at 3000 rpm. Shown in the inset is the Devon four-door version.

Fuel Spray "Stopped" for Studying Its Makeup

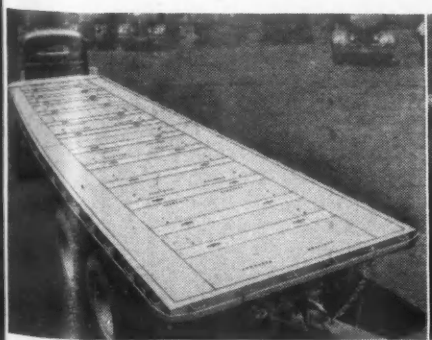
FUEL spray patterns of injection nozzles in internal combustion engines can be examined in detail at the Beacon Research Laboratory of the Texas Co. by means of ultra high-speed photography, stroboscopic light and a new injection nozzle test stand. The equipment shown here, by revealing fuel spray characteristics, is said to give results which permit petroleum technologists to determine whether spray patterns are correct for the most efficient combustion. It is anticipated that, by directly correlating these patterns with the nozzle designs, more efficient and reliable engine performance can be achieved through greater efficiency of air and fuel utilization.

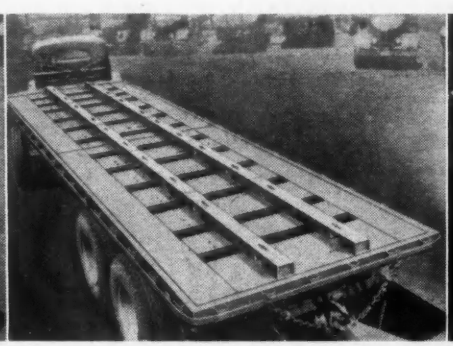
The fuel spray photographs can be taken in one to two millionths of a second, a time so short that the rapidly moving fuel spray can in effect be "stopped" at any point. Thus, considerable detail is revealed concerning the general shape of the spray and the direction and distribution of the fuel particles. The stroboscopic light is synchronized with the fuel pump, and the flashing circuit is arranged to permit either single or continuous shots. These shots show the spray pattern at any desired stage of its development from start to finish in this injection cycle. In analysis of aircraft engines experiencing dilution and hard starting, it was reported that this method proved of value in determining that these troubles were due to poor atomization. With the new data, it was possible to make recommendations which assured improved combustion.

Special Truck Floors

A NEW type steel floor for trucks and trailers, designed by Harold G. Nixon of the Mahoning Express Co., Youngstown, Ohio, to replace the wooden floors and wooden blocking now used in hauling hot steel products, is said to provide a more economical and faster means of transporting steel from the mill to the customer.

As shown in the photos, the new floor is composed of C channels running lengthwise on the truck or trailer bed. These are welded to the cross members of the vehicle. On top of the C channel is a fabricated ⅛-in. steel plate with steel mechanical blocking inset. This blocking is fabricated on top (left photo) with a ½-in. thick composition similar to brake lining to give the floor a non-skid surface. It also acts as a cushion for steel coils subject to denting. The photos indicate some of the placements of the blocking for making the floor adaptable to hauling steel sheet, bars, strip coil, heavy machinery or fresh fruits and vegetables. Since the structure of the floor will enable the carrier to transport steel in the hot or semi-hot condition, immediate transport of the steel would be possible. Also, it is claimed that the elimination of wood blocking and carpenter labor would result in savings.





Delco-Remy Introduces New Facilities for High-Volume Minimum-Cost Production

By Joseph Geschelin

THE Delco-Remy Division, General Motors Corp., Anderson, Ind., has realigned its facilities, introduced new sub-assembly and assembly lines, and mechanized operations for manufacturing a varied line of products in high volume at minimum cost levels. What was formerly the aluminum foundry for producing Allison engine castings has been converted to a plant for making horns and switches. Another building, a windowless air-conditioned structure originally erected for the production of Allison precision parts, has been redesigned for the mass production of distributors, coils and vacuum switches.

Each Delco-Remy plant is a complex of specialized assembly and sub-assembly lines designed to simplify handling and speed production. All of the operations are conveyorized, using all kinds of conveyors and materials handling devices, and served by a network of monorail conveyor lines. In the aggregate, the Delco-Remy operation boasts the following conveyors:

Overhead monorail conveyors	48,365 ft
Belt conveyors (four to 20 in. wide) for assembly lines	24,755 ft
Pallet conveyors	6,465 ft
Steel apron conveyors	2,760 ft

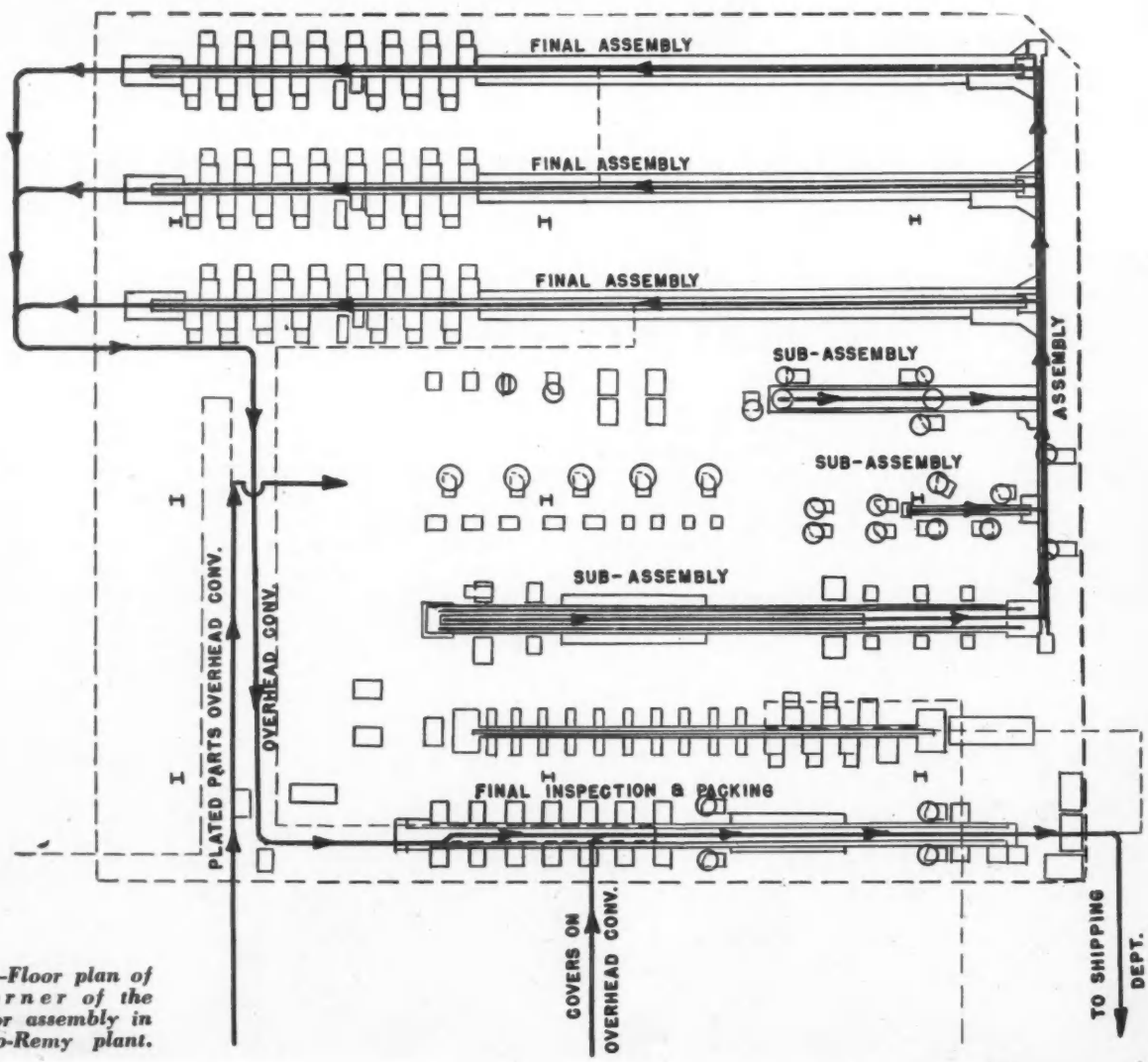


Fig. 1—Floor plan of one corner of the regulator assembly in a Delco-Remy plant.

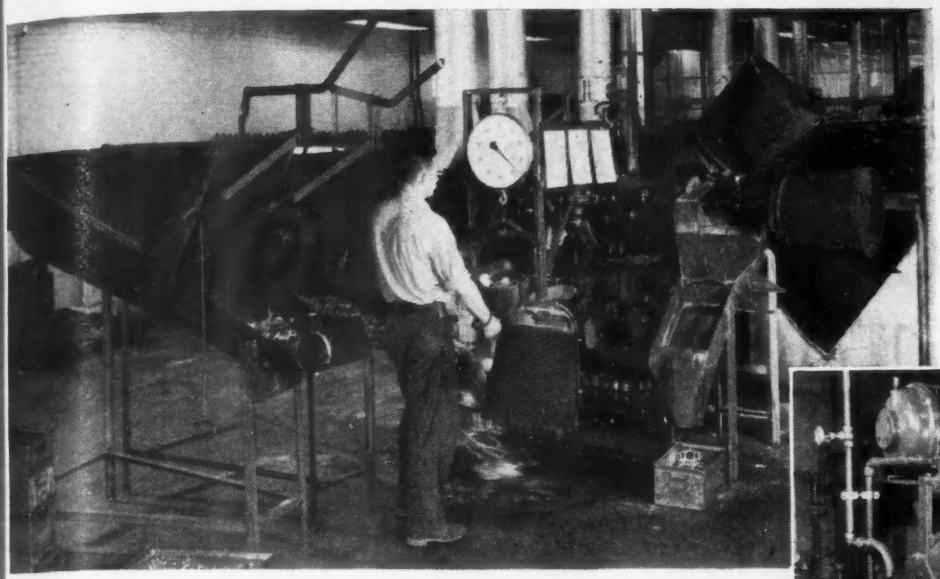


Fig. 2 — Continuous-automatic zinc-plating machine, manufactured by Frederic B. Stevens, Inc. The station in the foreground was added by Delco-Remy.

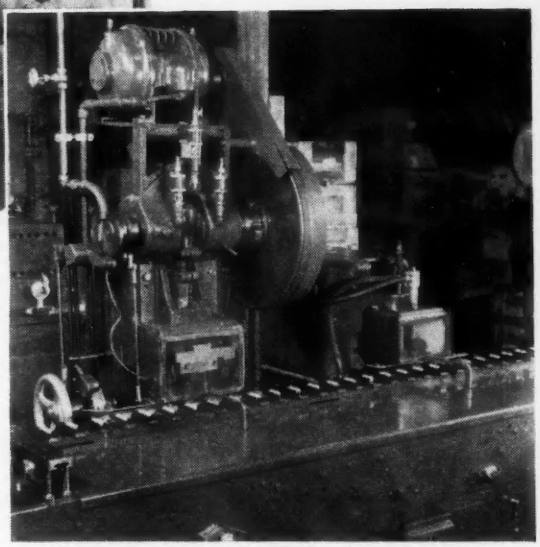


Fig. 4—(Below) this automatic crimping and soldering machine performs its operations while the conveyor is in motion.

Some impression of the planing of these lines can be gained from Fig. 1 which shows the floor plan layout of one corner of one of the plants. This diagram locates sub-assembly and final assembly lines, and indicates the flow of material to the assembly lines and packaging conveyors. Except for differences in detail, this layout may be considered typical of the arrangement in other departments.

An interesting machine used by Delco-Remy is a continuous automatic device for zinc-plating small parts and fastenings, as shown in Fig. 2. This long mechanized unit carries work-holding baskets which are progressively moved into and out of the plating tanks. The station in the foreground has been added to this new plating machine by Delco-Remy. At the operator's left may be seen the hoppers for storing the stock to be plated. Directly in the center is the weighing station. The operator weighs out the charge in a pan and dumps it into the basket at the loading station while the conveyor dwells momentarily. The loaded basket then proceeds through the conveyor cycle. Unloading of baskets is entirely automatic and takes place at the same station immediately to the right of the operator. At this point the basket is elevated to release its load directly into the chute, and thence into the

(*Turn to page* 64, *please*)

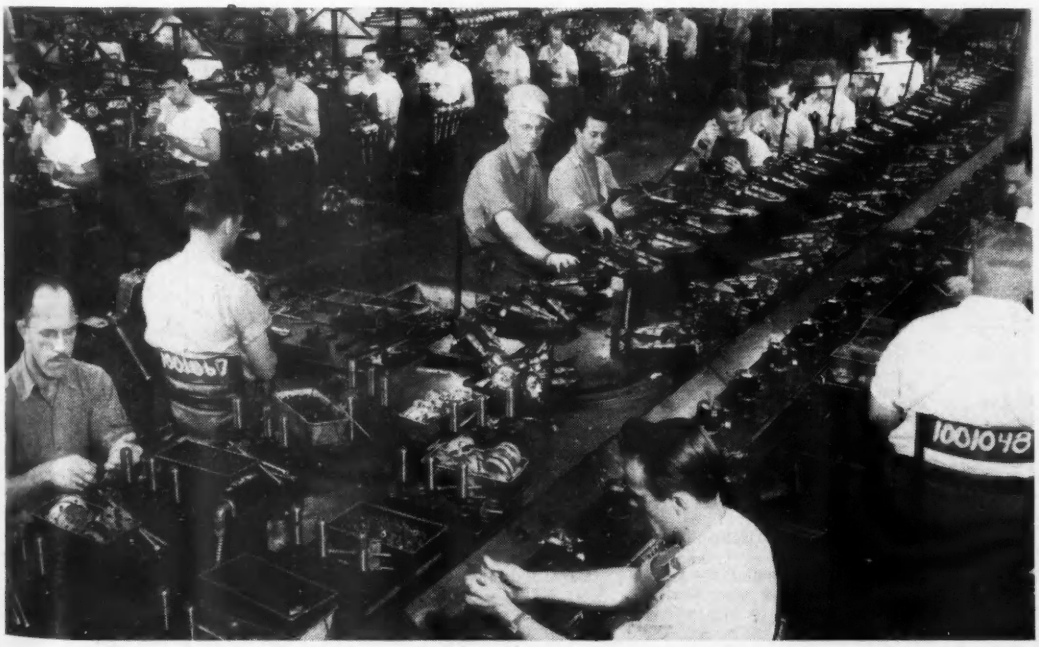


Fig. 3—New distributor assembly line at Delco-Remy. Parts are carried on a merry-go-round feeder conveyor in the center of the table; assembly is done on slower moving belt conveyors on each side of the table.

Steels Classified *for Automotive Gears*

By J. R. England and O. F. Hager,
Service Metallurgists,
Carnegie-Illinois Steel Corp.
United States Steel Corp. Subsidiary

ONE of the basic problems confronting a designer of any power-operated device, from a wrist watch to a Diesel locomotive, is the efficient transfer of energy between rotating or reciprocating members, usually involving an increase or decrease of speed ratios. The development of automobiles and aircraft has imposed the additional restrictions of weight, strength, wear resistance, and quietness of operation. On some machines, belt or friction drives satisfy these conditions, but gears are much more efficient for most applications.

In contrast with the limitations of simple cogwheels of earlier times, modern design presents a vast and complex choice of gears for power transmission between shafts at almost any angle and at speeds and loads undreamed of a quarter-century ago. The practicability of mass-production methods and the reliability of performance for such gears depends largely upon the versatility of alloy steels because of the wide choice of properties and processing methods which they afford. The increasingly exacting demands of designers and manufacturers have led to the development of a large variety of alloy gear steels and treatments.

Since the majority of highly-stressed gears are forged to secure proper flow lines, a gear steel undergoes its first test in the forge shop. Here, the severe

(*Turn to page 74, please*)

Principal Automotive Applications of Constructional Alloy Steels in Gears

Industry	Passenger Car, Light Truck, Light Tractor				Heavy Truck, Heavy Tractor, Bus		Aircraft		Machine Tool, Heavy Equipment		
Tensile Strength Range, psi	100,000 to 150,000	150,000 to 200,000	250,000 to 300,000		110,000 to 150,000	150,000 to 200,000	125,000 to 200,000	150,000 to 240,000	110,000 to 150,000	150,000 to 200,000	175,000 to 250,000
Heat Treatment*	A	A	B	C	A	A	A	A	A	A	C or D
Mn	1320		1340								
Ni				2340-45	2317 2512	2515-17	2512-17 AMS 6240 AMS 6242	2517 AMS 6242	2317 2512	2515-17	
											3140-45-50
Ni-Cr						3310-16 Super Kore AA		3310-16 AMS 6250 AMS 6253 Super Kore A		3310-16 Super Kore AA	
Mo	4023 27 32										
Cr-Mo			4140	4140-45							4140-45-50
Ni-Cr-Mo		4320 Super Kore C	4340	4340		4320 Super Kore C					4340
Ni-Mo	4620	4815 Super Kore B			4620		4620 AMS 6294		4620		
						4820 Super Kore B		Super Kore B		4820 Super Kore B	
Cr	5120		5135 40 45								
	8615-20		8640	8640-45 50	8620		8615-17-20 AMS 6270 AMS 6272 AMS 6274				8640-45-50
Ni-Cr-Mo	8720		8740	8740-45-50	8720				8720		8740-45-50
								9310-15 AMS 6260 AMS 6263 Super Kore A		9310-15 Super Kore AA	
			9840								9840-45 50
Cr-Mo-Al								Nitralloy AMS 6470			

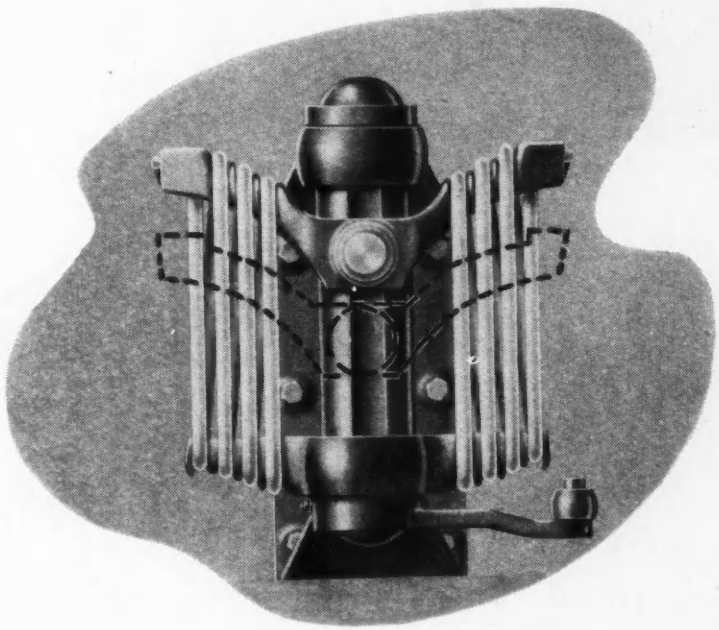
*Heat Treatment:
(A) Either (1. Carburize and oil quench from carburizing heat followed by temper at 275/375 F
(2. Carburize, air or retarded cool followed by reheating to 1450/1550 F, oil quenching and tempering at 275/375 F—treatment used to minimize distortion
(B) Heated to quenching temperature in a cyanide bath (to obtain a shallow case) followed by oil quenching and tempering at 350/450 F
(C) Oil quenched and tempered
(D) Normalized and flame hardened

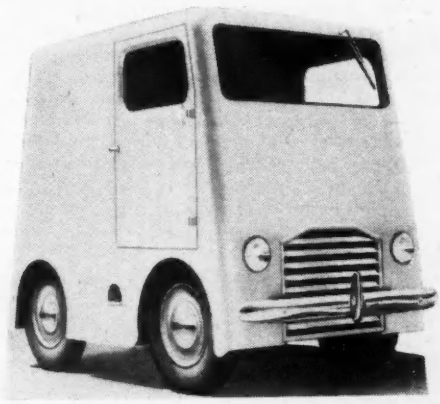
New Half-Ton Delivery Truck Weighs 1200 Lb

Basic Delcar Specifications

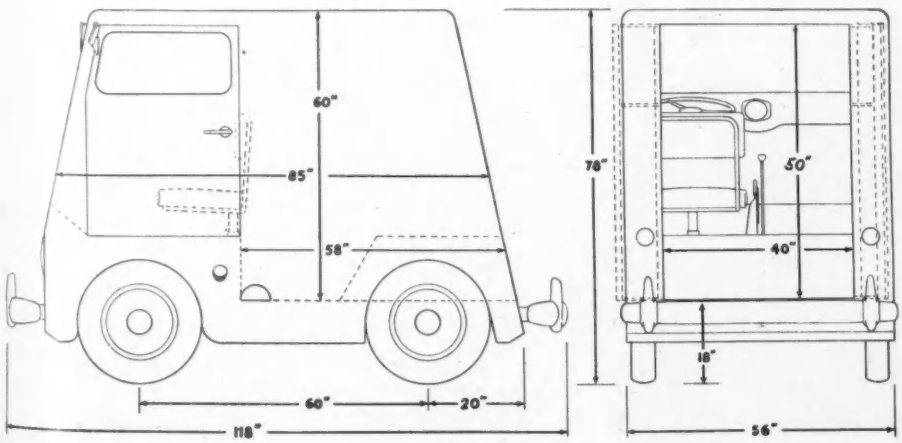
Wheelbase	60 in.
Overall Length	102 in.
Load (wgt)	1100 lb
Capacity (cu ft)	110
Weight (empty)	1200 lb
Clearance	8½ in.
Width	56 in.
Height	78 in.
Turning Radius	16 ft
Distance street to loading platform	18 in.
Engine	25 hp
Tires	5:50–16
Price	$890

THE Delcar, a new lightweight half-ton panel delivery truck is now being put into production at the Troy, N. Y., plant of American Motors, Inc. This cab-over-engine truck, which weighs 1200 lb empty, features independent four wheel, rubber shock cord suspension and complete elimination of conventional chassis. The engine, transmission, differential, and independent drive shaft to the rear wheels are mounted in a rigid welted steel box frame underbody, eliminating x-members, banjo housing, elliptical springs, rigid axles, shackle bolts, and shock absorbers. A 25 hp gasoline engine powers the Delcar. Major specifications for the Delcar are given in the accompanying table and line drawings.

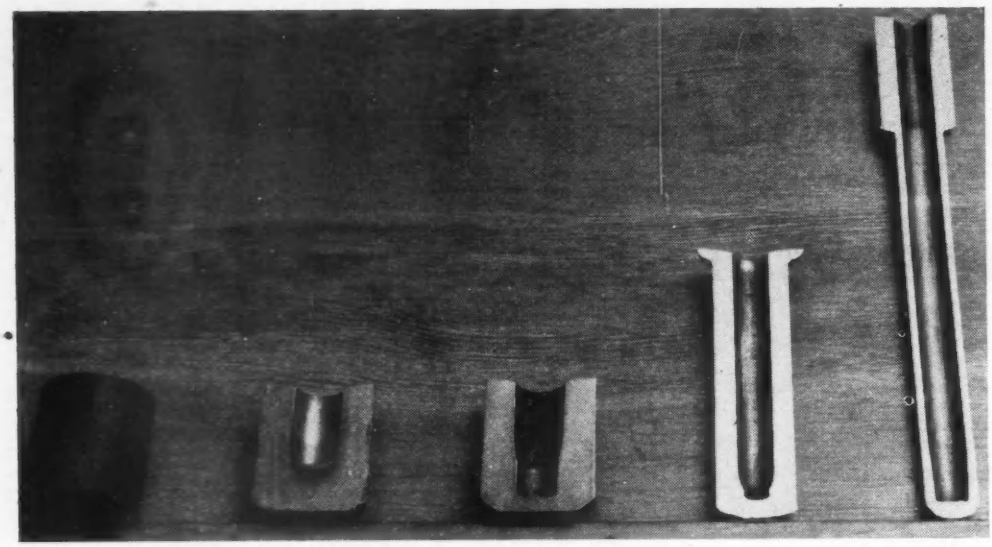




Three-quarter front view of new Delcar half-ton panel delivery truck, now being put into production by American Motors, Inc. in the Troy, N. Y. plant, and line drawings giving its major dimensions. Featuring independent four wheel, rubber shock cord suspension, this cab-over-engine truck is powered by a 25 hp gasoline engine.



Body and sub-body are independently sprung at each wheel as illustrated by this drawing, which shows special spindle unit in upper position and cords expanded when wheel goes over bump in road. The dotted part gives the normal position of the spindle under load. Ratio of sprung weight to unsprung weight is 10 to 1.

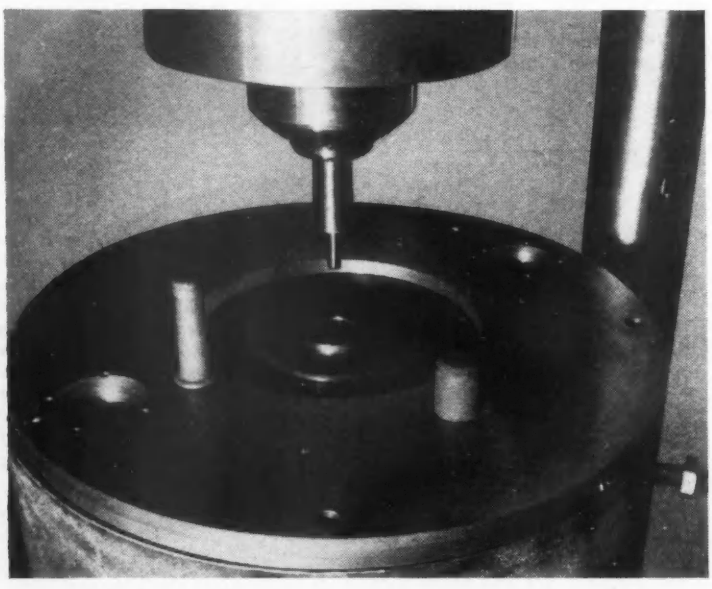


(Left) The five stages in the process for cold-extruding steel are shown here with the blank (left) and the sectioned pieces. The blank is punched in a closed die in the first operation, then extruded through an open die
(OTS—Commerce photo)

Cold Extrusion of Steel Investigated for

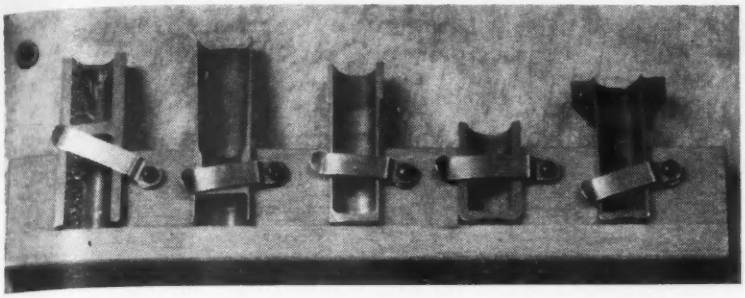
German Developed Process May Offer Low-Cost

(Below) This photo shows the punch about to descend into the open die to perform the third operation. Also shown is the piece before (right) and after (left). This experimental press is a 2500-ton Birdsboro; however, actual pressures used in extruding the steel are much less than this, varying from 15 to 80 tons per sq in. The die holder shown can take a tool for a much larger piece. (OTS—Commerce photo)

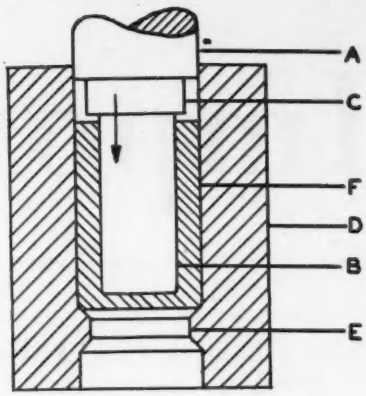


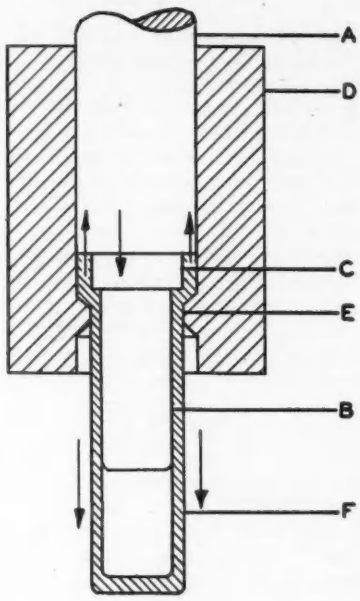
By Robert C. Mack

BY MEANS of a special German process for cold extruding steel, the Heintz Manufacturing Co., Philadelphia, expects to be able to produce automotive parts at a considerable savings in material and at a faster production rate than has heretofore been possible. This shaping or extruding of steel at room temperature, developed by the Germans and used by them during the war for manufacturing landing gear cylinders and cartridge cases, is now under investigation at Heintz for application to production of automobile parts such as spark plug bases and shock absorber cylinders. Heintz states that, so far, an astounding degree of success has been achieved with this process, and that present conclusions show



(Above) Sample pieces produced by the Germans with the cold extrusion process. Heintz claims to have obtained even better results. (OTS—Commerce photo)





(Right) These sectional drawings illustrate how the punch serves to extrude the steel through the open die. Press punch is shown at A, punch nose at B, punch shoulder at C, die at D, draw-radius ring at E, and the material at F. Above, the material, which has been shaped in the form of a cup, is inserted in the punch; and below, it has been extruded into the desired shape

Now Being Automotive Use

High Volume Method of Producing Automobile Parts.

great promise. German scientists, who were largely responsible for perfecting the process, have been at work on it at the Heintz plant.

The secret of cold extrusion is the special coating of phosphate given the steel before shaping. This coating acts as a crystal lubricant, permitting the steel crystals to flatten out and flow smoothly in the die. The steel, which can be ordinary 1010 bar stock, is extruded into the desired shape by means of a punch in an open die, an annular shoulder on the punch forcing the steel through the die and causing it to conform with the shape desired.

This process of cold extrusion is said to open up an entirely new field in metal working, permitting the rapid and economical high-volume production of items formerly made of malleable iron, drop forgings, or machined from bar stock. The use of hot forgings in many instances can be eliminated, it is claimed, and the dimensions of the cold extruded parts are so accurate that in many cases further machining is not necessary.

In preparation for press operations of either extruding or drawing, the round blank or slug of hot-rolled bar stock is first cleaned of scale by pickling or sand blasting. Then it is rinsed in cold and in hot water, and placed in a phosphating bath at a temp of about 200F for a period of one to four min, depending on the thickness of coating desired. After drying, it is lubricated with a light vegetable oil.

A typical five-step operation, producing a 25-in. cylinder for an aircraft landing gear, begins with a solid blank of hot-rolled bar stock, measuring 2.75 in. long by 3.5 in. in diam. First, the blank is placed in a closed die and a small depression, about ⅜ in. deep, is forced in the end. The object of this operation is to center the succeeding operations. In the second step, also in a closed die, the depth of the hole is increased to about four in. Then the piece is placed in an open die, and the shoulder of the punch forces the steel downward and through the draw ring of the die. This decreases the diameter of the cylinder and

(*Turn to page* 68, *please*)

Important Aircraft

The Allison V-1710 Exhaust Turbine Compounded Reciprocating Aircraft Engine

By Dimitrius Gerdan and J. M. Wetzler
Allison Div., General Motors Corp.

As a continuance of the war-time program which brought the combat rating of the Model V-1710 engine to well over 1.0 bhp per cu in., the Allison Division seriously resumed theoretical investigations to determine the additional output increase possible through the utilization of exhaust energy by means of a directly geared exhaust turbine. The outcome was a development program for a two-stage supercharged engine, with a geared exhaust-driven turbine. This engine, designated as the Allison model V-1710-E27 (AAF Model V-1710-127) is shown in complete assembly in Fig. 1. The gear train is shown in Fig. 2. Extensive tests were conducted with this engine, and as a part of the preliminary program, additional tests were run on a V-1710 two-stage supercharged engine gas coupled to a General Electric Co. model C-23 turbo-supercharger whose turbine and compressor performance characteristics were known.

After the completion of initial testing in which auxiliary stage inlet elbow modifications were made, tests at 30,000 ft altitude and 3200 rpm showed a total power output of 1530 bhp. The calculated turbine output at this condition was 550 hp and the exhaust temperature was 1600 F. The comparable engine without the exhaust turbine developed 1200 bhp under the same conditions. Tests were also run at 25,000 ft altitude at the two engine speeds in order to determine the gains possible in fuel economy. Fig. 3 presents the results at 2700 rpm both with and without the feedback turbine at a wide range of fuel air ratios. At a fuel air ratio of 0.066 the turbine feedback showed a brake specific fuel consumption of 0.450 whereas the conventional two-stage engine showed a consumption of 0.570, there being a reduction of 21 per cent as a result of exhaust turbine compounding. Under these conditions the engine output increased from 825 to 1120 bhp for a gain of 36 per cent.

At this point in the program development of the compounded reciprocating engine was dropped. However, fairly extensive design studies had shown that it was possible to accommodate two stages of supercharging, after-cooling, the exhaust turbine and exhaust piping and integral reduction gear in an overall engine length of about 97 in. This engine was estimated to have a total dry weight of 1950 lb. It was felt that the experience to this point would permit a conservative guarantee of the performance figures shown in Fig. 4. War Emergency, or Combat Ratings, would have been about 33 per cent greater at sea level and at the Combat Rating critical altitude.

Reasons for dropping this program were based largely on the fact that an even greater revolution had taken place in the service use of gas turbine

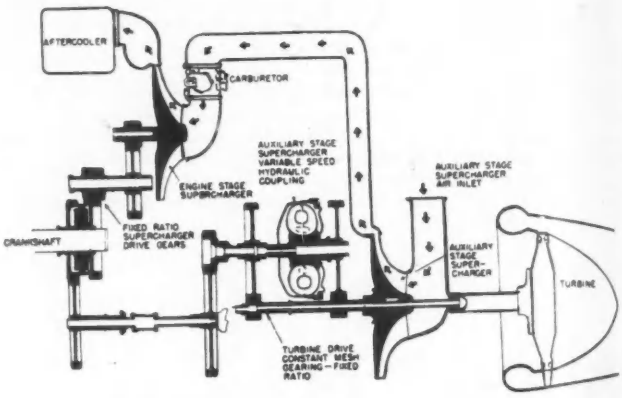


Fig. 2 Gear train for compound model V-1710-E27 engine

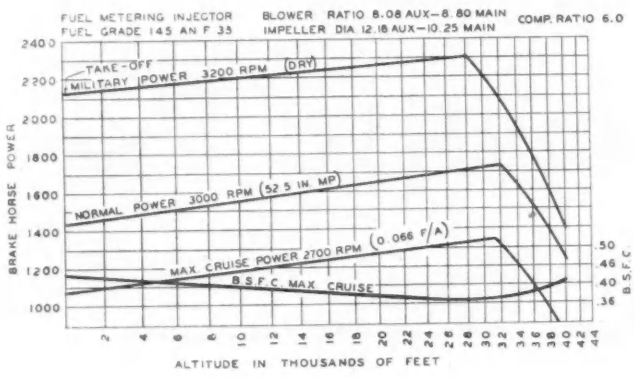

FUEL METERING INJECTOR
FUEL GRADE 145 AN F 33
BLOWER RATIO 8.08 AUX—8.80 MAIN
IMPELLER DIA 12.18 AUX—10.25 MAIN
COMP. RATIO 6.0
TAKE-OFF MILITARY POWER 3200 RPM (DRY)
NORMAL POWER 3000 RPM (52.5 IN. MP)
MAX CRUISE POWER 2700 RPM (0.066 F/A)
B.S.F.C. MAX CRUISE
BRAKE HORSE POWER
B.S.F.C.
ALTITUDE IN THOUSANDS OF FEET

Fig. 4 Estimated performance of the compound V-1710 with geared turbine

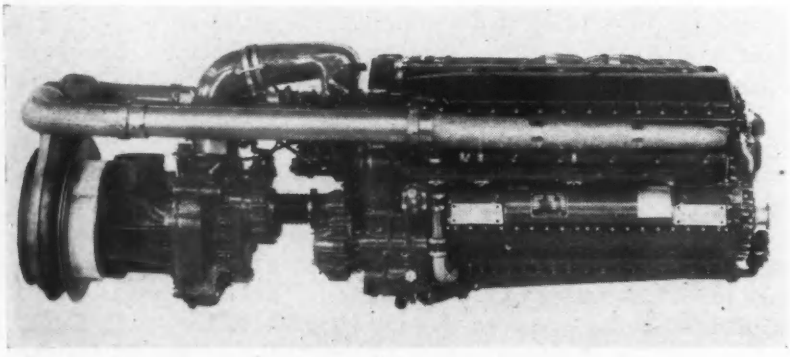


Fig. 1 The Allison model V-1710-E27 two-stage supercharged engine with a geared exhaust-driven turbine

Developments

Presented at the SAE National Aeronautic Meeting, Held in Los Angeles Recently, Were Several Interesting and Important Papers on Compound Engines, Propeller Noise, Hydraulic Packings, Engine Costs of the Personal Plane, Aircraft Manufacturing Costs, Wright's Electronic Computer, and Gas Turbine Metals. Abstracts of These Papers Are Given Herein.

engines. Concurrent studies of turbo-propeller engines plus production and development experience with turbo-jets showed that the two to three year period required to bring the compounded engine to a practical stage would be a serious waste of engineering manpower. This was fundamentally based upon the need for a compounding turbine capable of using exhaust gases at temperatures up to 1950 F. The development of a unit capable of operating with such gas temperatures would pay far greater dividends if applied to the turbo-propeller engine rather than to a compounded reciprocating engine.

Reduce Airplane Noise Through Basic Design

By W. E. Burnham
Staff Engineer
Beech Aircraft Corp.

THE greatest noise-maker in currently designed airplanes is the propeller. It has been reported by sound experts that unless the fundamental note of the propeller vibration noise is reduced drastically, it would be impossible to reduce the noise level of an airplane appreciably, especially with respect to the outside of the airplane.

Propeller noise consists mainly of two components: the rotational note which has a frequency equal to the number of rotations per unit time multiplied by the number of blades in the propeller; and the vortex noise which has a very complex frequency spectrum ranging from 1000 cps upwards. The rotation is a fundamental note—a low pitched roar, and it is accompanied by a large number of harmonics which are multiples of this fundamental. Usually there is more acoustical energy in the fundamental note than all other frequencies. The low-pitch propeller roar is the chief cause of propeller noise with most propellers of conventional rpm. It should be noted, however, that such is not necessarily the case if considerable reduction in rpm is considered. The intensity of the rotational note, or low-pitch roar, is highest slightly aft of the plane of rotation of the propeller disc.

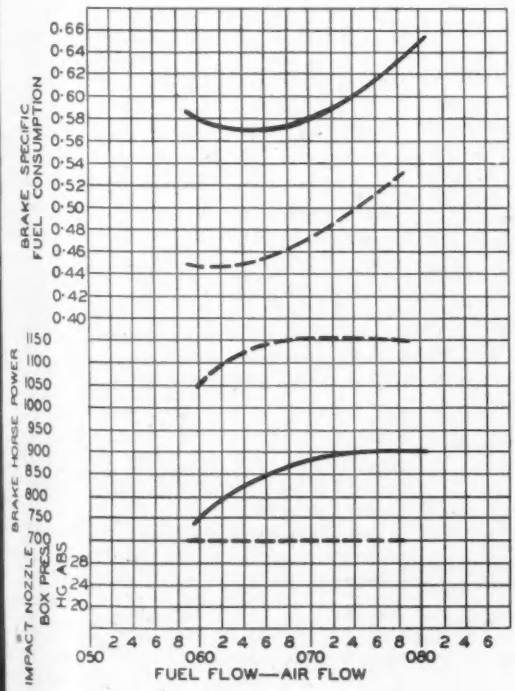


Fig. 3
Performance curves of V-1710 engine with and without the turbine power feedback for full throttle and minimum slip at 25,000 ft altitude. The compression ratio was 6.0 to 1 and auxiliary standard blower ratio was 7.64 to 1. The solid curves show the performance of the engine without the turbine, operating at 2700 rpm and with 8.1 to 1 engine standard blower ratio. The dotted curves represent the V-1710 with the feedback turbine, operating at 2700 rpm, 8.8 to 1 engine standard blower ratio, and 28 in. Hg. absolute nozzle box impact pressure

Table I—Noise Levels of Different Propellers

Type	Diam. (ft)	RPM	Noise Level at 300 ft (db)	Noise Level at 1000 ft (db)
Two-blade fixed pitch	6	2600	95	86
Two-blade fixed pitch	10	1000	68	50
Eight-blade fixed pitch	8	1000	60	45
Two-blade constant-speed	6	2600	95	86
Two-blade constant-speed	10	1000	68	50
Eight-blade constant-speed	8	1000	60	45

The vortex noise is caused by the turbulent air causing vortises to be formed, which are shed off the blades. The vortex motion has a very complex frequency spectrum, composed of the continuous distribution of frequencies from about 1000 cycles up. The intensity of the vortex noise is a function of thrust. Therefore, if propeller speeds are reduced appreciably, the vortex noise will become predominant and must be dealt with accordingly. The maximum intensity of the vortex noise is on the axis of the propeller rotation.

Since the noise level is largely a function of tip-speed, it is mandatory that the rpm be reduced, and slow-turning propellers be used. Thus, the advantage of multi-blades, because of the vortex noise, is not so great as has been indicated in some of the earlier studies. Fig. 5 shows the variation in loudness level at 300 ft in decibels against Mach

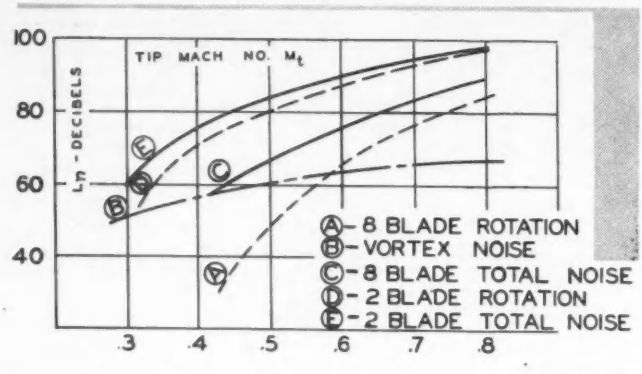


Fig. 5
Variation in loudness level in decibels against Mach number for two and eight-blade propellers at a distance of 300 ft

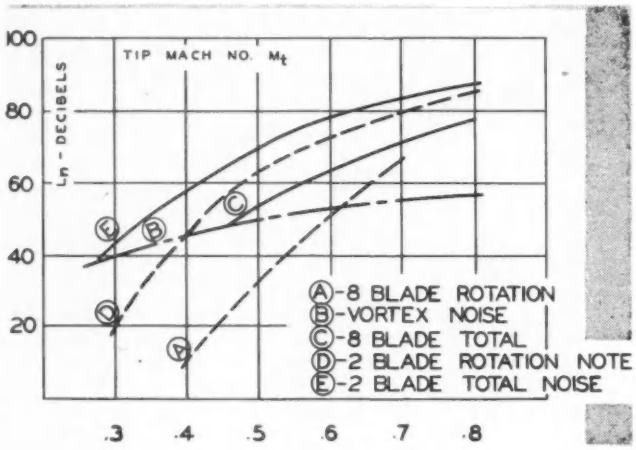


Fig. 6
Variation in loudness level vs. Mach number for two and eight-blade propellers at a distance of 1000 ft

number for two and eight-blade propellers. Fig. 6 shows the variation of loudness level against Mach number at a distance of 1000 ft. It may be noted that at 1000 rpm, and at a distance of 300 ft, the loudness level of a two-blade propeller is only some six db higher than that of an eight-blade propeller. All the noise heard by the observer at 1000 ft is vortex noise, and is therefore the same for two, four, six or eight-blade propellers. From these data, it is shown that the important thing is to reduce the rpm, or rather the tip-speed, if noise is to be reduced, and that the number of blades is unimportant.

From considerations of optimum rotational speed, propeller efficiency, static thrust and climb performance characteristics, it appears that for moderate airspeeds at least, the propeller required for best efficiency is also about right for a quiet propeller.

In order to clarify this study an hypothetical airplane with a design speed of 120 mph, powered with an engine which develops 100 hp, was fitted with six different propeller configurations, and noise levels were observed at distances of 300 ft and 1000 ft from the airplane. Results of these tests are shown in Table I.

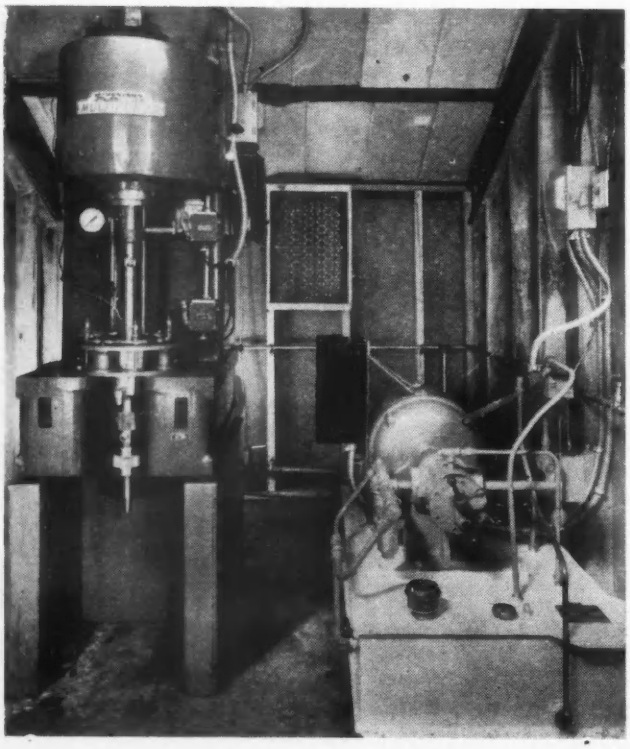


Fig. 7
Equipment for O-ring friction studies

Research on Aircraft Hydraulic Packings

By Tommy J. McCuistion, Frederick E. Clark, Richard A. Clark and LaVerne E. Cheyne, Battelle Memorial Institute

FRICTION studies of O-rings in actual operation were conducted at the Battelle Memorial Institute to determine the forces involved in the life and function of an O-ring. A Denison Multipress was employed as the nucleus of the equipment. This instrument provided a means of varying and controlling stroke speeds. It was used together with a 3000 psi variable flow pump. The general setup is illustrated in Fig. 7.

It was desired to test only one packing at a time in order to avoid the phenomenon known as "toe stubbing." This was achieved by a lap lit at one end of the cylinder. The lap necessary was found to have about two lb friction at all pressures. Leakage from the lap end of the cylinder was caught and returned to the system. Frictional thrust occurring between the packing and piston rod was transmitted to three bellows arranged around the test cylinder. These bellows were connected to an engine pressure indicator completely filled with a liquid and sealed. When loads were applied to the cylinder, an autographic record was made on an indicator card. The frictional force was one coordinate; the other was the displacement of the piston rod. Time delay switches for controlling the pressure and stroke cycles were provided on a control board.

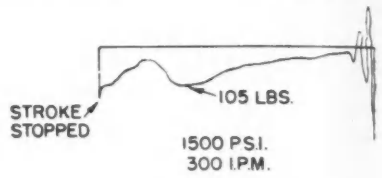


Fig. 9
Increase in O-ring running friction

An unexpected thing learned in these O-ring friction studies was the influence of static time. It seemed to make little difference whether fluid pressure was applied during the delay period. Its effect seems to be an increase in the rate of friction build-up, rather than in the total friction. It is not known at this time whether or not breakout friction is consistent enough to be used for design purposes. Indications are that friction may vary as much as ±10 or 15 per cent with all other variables controlled as accurately as possible. It should also be noted that various rubber compounds have different frictional characteristics.

The amount of friction of any given packing will depend primarily upon pressure, size and cross section of packing, and stroke speed. Other factors are such things as metal surface finish, squeeze, side loads on cylinders, type of fluid, and temperature of operation.

It is interesting to note that as stroke speed is increased, breakout friction is increased, but running friction is reduced. The delay time preceding each stroke, which is a major factor affecting breakout friction, seems to have little effect upon running friction. As shown in Fig. 8, both running and breakout friction rise with increase in operating pressure and squeeze, although this seems to be true only with very smooth finishes.

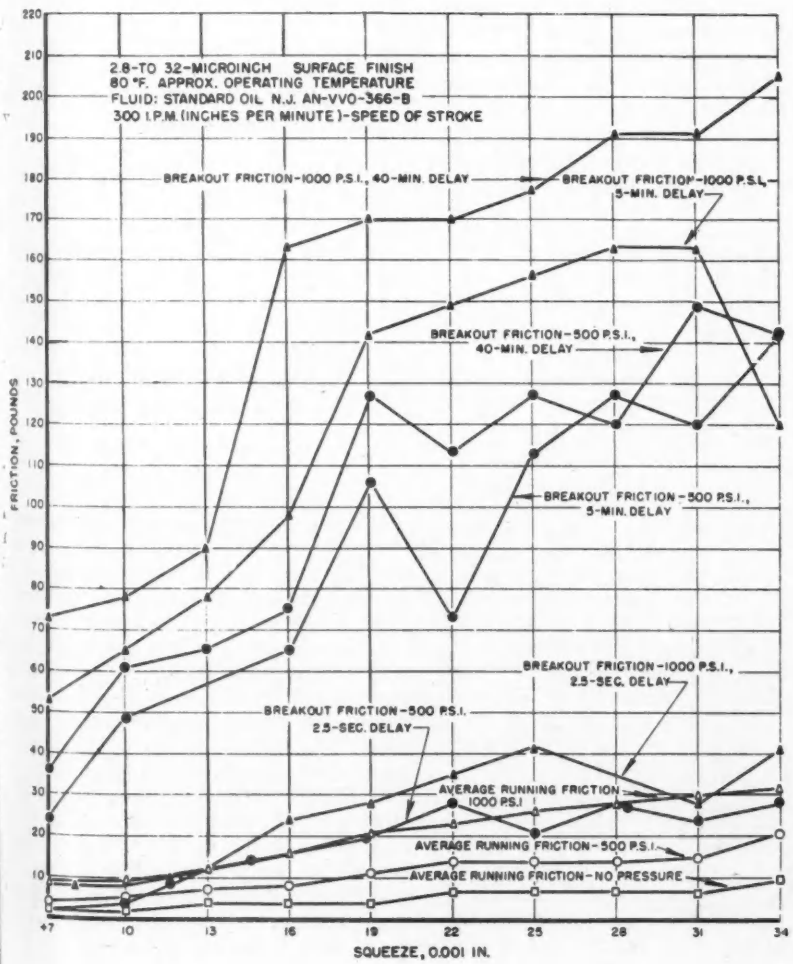
Fig. 9 shows an increase in the running friction curve. It was decided after some speculation that these humps or increases in the running friction curve might be an evidence of the twisting of the packing in its groove. This was proved by stopping the stroke at the peak of the hum (Fig. 9), leaving the pressure at 1500 psi, and applying heat (200 F) for several hours. When the packing was then removed, an extrusion line was clearly visible, spiralling around the packing, yet the original flash line was still clearly visible. By twisting the packing "spiral failures" were produced.

Chemical Composition of Turbosupercharger and Gas Turbine Materials*

Material	C	Mn	Si	Cr	Ni	W	Mo	Cb	V	Co	Ti	N_2	Fe
Deep Drawing Carbon Steel	0.15	0.40	0.30	—	—	—	—	—	—	—	—	—	Bal
SAE 2335	0.35	0.70	0.30	—	3.0	—	—	—	—	—	—	—	Bal
SAE 4140	0 40	0.87	0.28	0.95	—	—	0.20	—	—	—	—	—	Bal
SAE 4340	0.40	0.70	0.28	0.80	1.85	—	0.25	—	—	—	—	—	Bal
SAE 6150	0.50	0.80	0.30	1.0	—	—	—	—	0.20	—	—	—	Bal
Silchrome #1	0.45	0.60	3.00	8.5	—	—	—	—	—	—	—	—	Bal
K & E 965	0.38	0.70	1.4	13.0	13.0	3.0	—	—	—	—	—	—	Bal
17W	0.50	0.70	0.60	12.0	19.0	2.25	1.0	—	—	—	—	—	Bal
Gamma Columbium	0.40	0.50	1.00	15.0	25.0	—	4.0	2.0	—	—	—	—	Bal
Timken	0.10	1.00	0.75	16.0	25.0	—	6.0	—	—	—	—	0.15	Bal
19-9-DL	0.30	1.00	0.60	19.0	9.0	1.0	1.0	0.30	—	—	0.30	—	Bal
Vitallium	0.25	0.60	0.60	27.0	2.0	—	5.5	—	—	Bal	—	—	1.0
Hastelloy B	0.07	0.75	0.75	—	65.0	—	28.0	—	0.35	—	—	—	6.0
S-816	0.40	0.75	0.75	20.0	20.0	4.0	4.0	4.0	—	42.0	—	—	4.0
KA2SMO (Type 316)	0.08	1.75	0.50	18.0	13.0	—	2.5	—	—	—	—	—	Bal
Type 347	0.10	1.50	0.75	18.0	10.5	—	—	0.80	—	—	—	—	Bal
Cast 25-20	0.18	1.50	1.50	25.0	20.0	—	—	—	—	—	—	—	Bal
Wrought 25-20	0.08	1.25	0.50	25.0	20.0	—	—	—	—	—	—	—	Bal
29-9 Weld Wire	0.12	1.50	0.75	29.0	9.0	—	—	—	—	—	—	—	Bal

* This table was taken from the paper, "The Metallurgical Aspects of Gas Turbine Wheels and Nozzles" by E. M. Phillips, General Electric Co.

Fig. 8
Effect of pressure and squeeze on O-ring running friction


2.8-TO 32-MICROINCH SURFACE FINISH
80 °F. APPROX. OPERATING TEMPERATURE
FLUID: STANDARD OIL N.J. AN-VVO-366-B
300 I.P.M. (INCHES PER MINUTE)-SPEED OF STROKE
BREAKOUT FRICTION-1000 P.S.I., 40-MIN. DELAY
BREAKOUT FRICTION-1000 P.S.I., 5-MIN. DELAY
BREAKOUT FRICTION-500 P.S.I., 40-MIN. DELAY
BREAKOUT FRICTION-500 P.S.I., 5-MIN. DELAY
BREAKOUT FRICTION-1000 P.S.I., 2.5-SEC. DELAY
BREAKOUT FRICTION-500 P.S.I. 2.5-SEC. DELAY
AVERAGE RUNNING FRICTION-1000 P.S.I.
AVERAGE RUNNING FRICTION-500 P.S.I.
AVERAGE RUNNING FRICTION-NO PRESSURE
FRICTION, POUNDS
SQUEEZE, 0.001 IN.

Engine Compounding for Power and Efficiency

By Erold F. Pierce and Harvey W. Welsh
Wright Aeronautical Corp.

THE optimum system of power recovery would be a combination of the blowdown and pressure systems. In this type of unit, the gas would blow down a pressure of 25 to 40 in. Hg. abs. in a blowdown turbine, after which it would be collected and expanded to atmospheric pressure through a steady flow turbine. The available exhaust energy at 30,000 ft altitude for this combination blowdown and pressure system, in terms of output increase over the basic engine, is 59.3 per cent. Output increase with the pressure system is 46.5 per cent, and for the blowdown system, 36.7 per cent. Thus the energy available for recovery with this double compound system is much greater than either system alone, and the realization of a practical design is considered quite possible.

In this type of double compound engine, a convenient division of power is to use the pressure turbine to drive an auxiliary supercharger while the blowdown system returns power to the engine crankshaft. A waste gate must be included between the blowdown and pressure turbines to control the pressure drop across the steady flow unit and the power output, and represents a power loss unless the available jet thrust is utilized. However, the loss through the waste gate is fairly small since the blowdown turbine has already

removed energy from the gas and reduced its temperature, resulting in a more nearly closed waste gate position than in the usual turbosupercharger installation. The performance of this type engine is shown in Fig. 10.

This system has a definite advantage for high altitude work in that satisfactory operation can be obtained with one or, at the most, two turbine-to-engine gear ratios. This is due to the fact that the discharge pressure on the blowdown turbine (which returns power to the crankshaft) is always operating at a turbine exhaust pressure which is roughly independent of altitude, hence the blowdown velocity is almost constant.

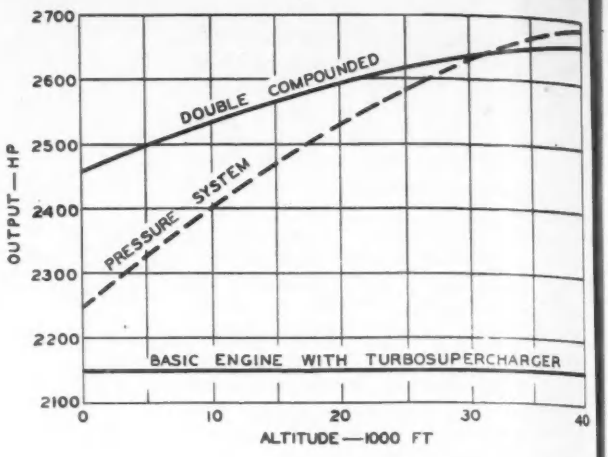


Fig. 10
Comparison of performance of pressure turbine and double compound engine

Future Power for the Personal Airplane

By John W. Thorp, President
Thorp Aircraft Co.

THE "variable configuration" study, a very valuable economic tool of the airplane designer, is used in all engineering professions dealing with sufficiently complex variables that simple equations cannot yield required answers. The engine designer can and does use this tool with profit in establishing many of his required trends. An example of this technique is shown in Fig. 11. This is a joint airplane and engine problem. It is required to show how much engines of varying weight per hp are worth when applied to typical two and four-place personal airplanes. In practice, if the engine designer was making such a study he would also determine how much weight per hp effected the cost of his engines. By superimposing the curve of cost upon the curve of worth, he could determine the engine weight per hp that he should build in any line for the greatest profit.

Fig. 11 shows what the airplane manufacturer can afford to pay for engines of various weights per hp when used to power a $2400 two-place "minimum essential" airplane designed to cruise 100 mph at 75 per cent power for four hours with 40 lb of baggage and both seats occupied, and when used to power a $7000 four-place "utility" airplane designed to cruise 150 mph at 75 per cent power for four hours with 100 lb of baggage and all seats occupied.

The results shown on Fig. 11 are for a particular set of conditions. Changing any of the factors will influence results considerably. Engine weight will have different values for each airplane specification and for any set of conditions that are applicable at the time the study is made. The results shown should be thought of as relative and not absolute.

If a set of curves such as shown in Fig. 11 are to give a true picture of the relative worth of engines of varying weights per hp, the airplanes used to determine values must not only satisfy load carrying, speed, and range requirements, but must provide equivalent safety as well. This is insured by requiring that the airplane take off in 300 ft; that the power off minimum sinking speeds not exceed 600 fpm; that, in the case of the two place airplane, the maximum rate of climb be at least 600 fpm; and that, in the case of the four-place airplane because of higher speeds in the climb, the maximum rate of climb be at least 1000 fpm. Performances are for sea level conditions in standard air. Also the curves assume proportions for the two-place airplane equipped with fixed-pitch wooden propellers, and constant-speed propellers for the four-place airplane. Propulsive characteristics are based upon an assumed tip speed of 800 fps at rated rpm. A specific fuel consumption of 0.50 lb per bhp per hr is assumed for the engines. The cooling system weight and cost is assumed to be included in the weight and cost of the engine. Both airplanes are assumed to be equipped with slotted flaps. The landing gear of the two-place airplane is assumed to be fixed tricycle, with tricycle retractable for the four-place airplane.

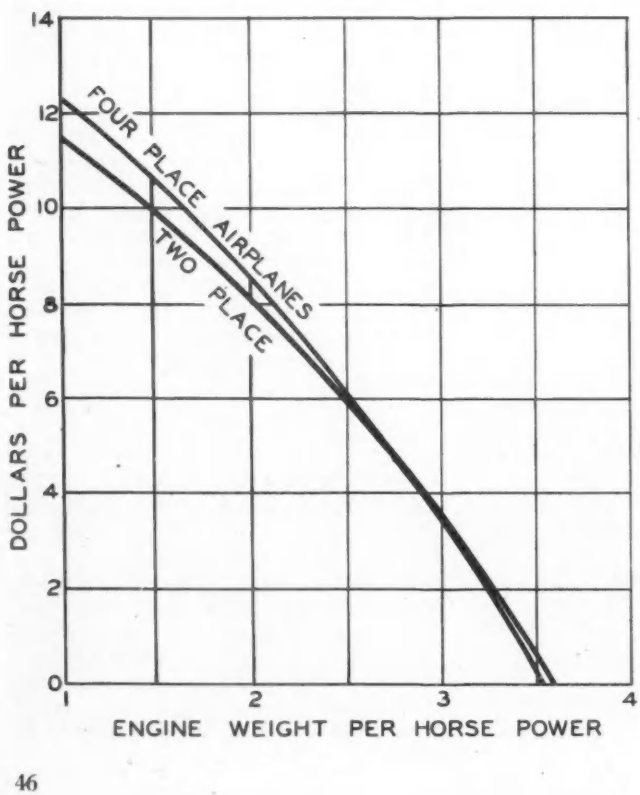


Fig. 11
Engine "break-even" price per hp. The curve shows the price that the airframe manufacturer can afford to pay for an engine of any given weight

The Designer and Manufacturing Costs

By George W. Papen
Design Engineer
Lockheed Aircraft Corp.

THE degree of factory efficiency, tooling ingenuity and purchasing resourcefulness will determine how closely the factory approaches the minimum cost, but the most efficient factory methods, ingenious tooling and resourceful purchasing cannot reduce the cost of the airplane below the minimum established by the design engineer. Fig. 12 illustrates the distribution of the costs of manufacturing a commercial transport. The design engineer affects each of these categories to some extent. By his design he can expend or contract the total area of the chart or can change the ratio of one division to another. An uneco-

(*Turn to page 82, please*)

New Willys Products

Willys-Overland 6-Cylinder Engine Condensed Specifications

Type	L-head
No. Cylinders	6
Bore	3 in.
Stroke	3½ in.
Displacement	148.5 cu. in.
Compression Ratio	6.42 to 1
Brake Hp (max.)	72 at 4000 rpm.
Torque (lb. ft. max.)	117 at 1600 rpm.
No. main bearings	4
Lube Oil Capacity	5 qt.

Scheduled for production late in 1948, the Willys-Overland 6-71 sedan shown above, to be powered by the new six-cyl engine, has a 104 in. wheelbase. Comfortably seating five persons, the 6-71 will be available in both two door and four door models.

On the occasion of the company's Second Annual Institution Day, Willys-Overland, Inc., in restating its current production plans, pointed particularly to its newest products. These include the 6-passenger Station Sedan with the new 6-cylinder Willys engine; the Sport Phaeton, called the "Jeepster"; and the new 6-cylinder engine. Advance details on the long-deferred passenger car model were also given out.

The new models are all based upon the philosophy of interchangeability that has characterized Willys-Overland vehicles since the end of the war. The Station Sedan model, for example will use the same sheet metal as does the present Station Wagon and will be mounted on the standard chassis with specifications to be noted later.

The Jeepster Sport Phaeton will be mounted on the standard 4-cylinder chassis but will not have overdrive and will be fitted with a rear axle ratio of 4.44 to 1. In addition, this model will have an X-member frame to provide exceptional torsional rigidity. To achieve interchangeability on the assembly line, the transmission for this model will have an extrusion long enough to compensate for the overdrive unit, thus providing for the use of the same propeller shaft.

With the introduction of the 6-cylinder model Willys will have a new frame so arranged as to accommodate the standard 4-cylinder and 6-cylinder engine without affecting either running gear or radiator mounting. The front end sheet metal will be a universal mounting capable of handling radiators for several different purposes. These include—the standard radiator for 4-cylinder engines; a larger capacity unit for tropical service with the 4-cylinder engine; a radiator for the standard 6-cylinder engine which will be the same as the 4-cylinder tropical unit; and a still larger unit for tropical service with the six. Tropical service radiators will have pressure caps, the others are without pressure caps.

To make up for the forward location of sheet metal necessary to accommodate the 6-cylinder engine radiator and engine clearance, the radiator for the 4-cylinder models is fitted with a shroud.

The same frame and arrangement also will be used for the 6-cylinder passenger car model when that job is ready for production. At this writing it seems doubtful that the passenger car will be ready in 1948 as it was stated at the press conference, that it would take 12 to 14 months to prepare the necessary tooling after the model was finally approved for production.

At the moment the plan, tentative at least, is to offer the passenger car in two types—standard and deLuxe—and in two body styles—two-door and four-door, the standard models to be mounted on the same chasis as the Station Sedan including the conventional axle but without overdrive. The deLuxe models, on the other hand, would have overdrive and the proposed swinging axle. It is said that the swinging axle design will weigh more and will cost more.

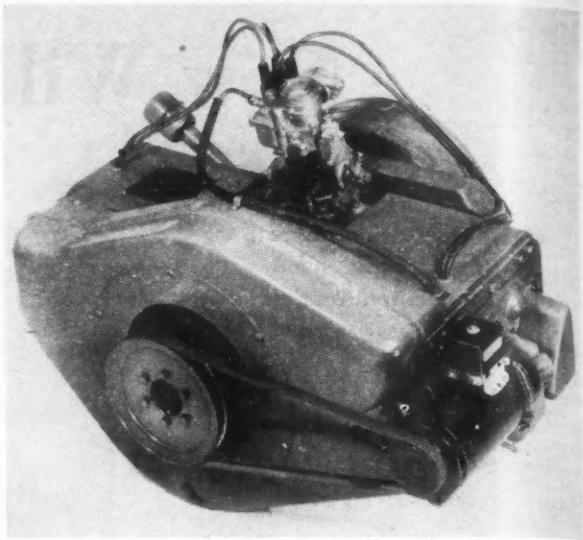
If and when the passenger car is placed in production, it is also possible that provisions will be made to build an export model using the 4-cylinder engine in a standard chassis.

In any event, the styling of the passenger car, as indicated by the mock-up will be entirely new and distinctive. And in sheet metal, at least, will depart from the principle of interchangeability discussed in connection with other models.

(*Turn to page 70, please*)

Scheduled for early 1948 production, a new all-steel passenger station sedan, to be powered by a new six cyl engine, and a new convertible-type sport passenger car were recently previewed by Willys-Overland Motors at the company's second annual Institutional Day in Toledo, O.

Improved Franklin Engine For Trucks and Tractors

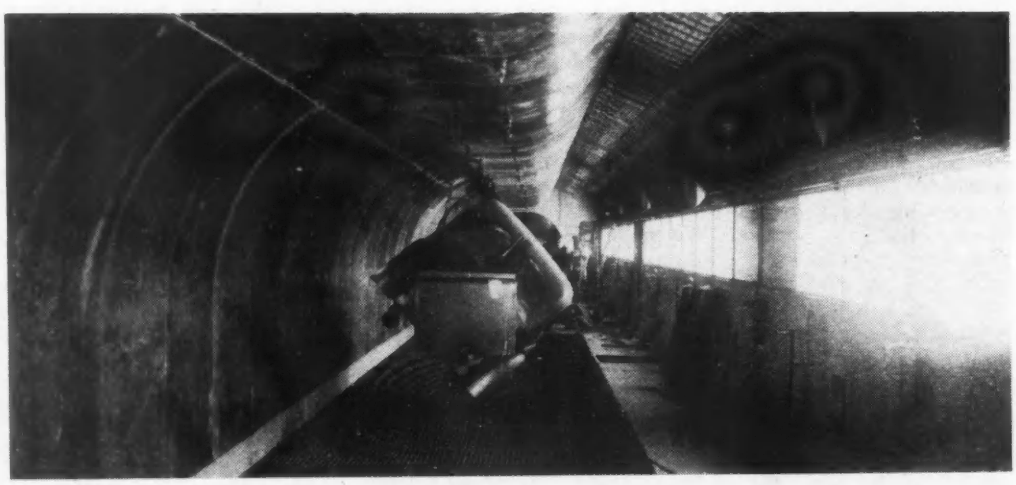


Now available for heavy-duty service in motor trucks and tractors and for general industrial use is the four-cylinder Franklin 4CHO-150 aircooled gasoline engine shown in the accompanying photo. Manufactured by Aircooled Motors, Inc., this improved version of the model formerly used for the White Horse truck is of the horizontally-opposed type and has a 3⅝ in. bore and stroke with 150 cu in. displacement. Compression ratio is 6 to 1, and output is 50 hp at 3000 rpm with 100 lb-ft of torque at 1200 rpm. Changes from the former model include: use of an aluminum crankcase marking a weight reduction of 65 lb; aluminum pistons; pressed-steel timing-gear case cover to replace cast covers; counterweighted crankshafts with either Tocco-hardened journals or a fully nitrided shaft depending on the customer's specifications. Main and connecting rod bearings are of Cleveland Graphite Trimetal F-77 instead of the Clevite No. 35 copper-lead alloy formerly employed.

The Wilcox-Rich hydraulic valve lifter installation has been redesigned to eliminate drilling and extra headers in the crankcase. At the same time oil from the valve lifters will be circulated through hollow pushrods for lubricating the valve mechanism. The older versions had outside oil lines. Also, instead of an exhaust heated hot spot used formerly, the new model is fitted with a crankcase cover which includes the carburetor distributing zone. Heat is supplied to the underside of this zone by oil splash from within the engine.

When used for vehicular application the engine is fitted with a Franklin type torsional vibration damper in which the fan is coupled to the fan hub through Thermoid rubber disks. The fan is 12 in. in diameter with 55 blades, delivers about 2000 cfm of air at 2500 rpm and absorbs about four hp at that speed.

Austin's Body Painting Plants Cost $400,000



This new conveyor painting plant, said to be the only one of its type in Europe, has been installed by Austin Motors, England, at a cost of more than $400,000. The spraying tunnel is 130 ft long, and is provided with fluorescent lighting its entire length. Filtered, heated and humidified air is introduced into the booth at the rate of 140,000 cfm to maintain a completely dust-free atmosphere. The overhead conveyor, moving at seven fpm, carries the bodies in counter-balanced cradles which can be turned with one hand to give accessibility to all parts. A centralized paint mixing plant keeps the paint consistent in quality and temperature. From this plant, pipes carry the mixture direct to the sprayers. After spraying, the conveyor carries the bodies through a 300-ft drying oven which has four heating zones.

New Production and Plant EQUIPMENT

For additional information regarding any of these items, please use coupon on page 60

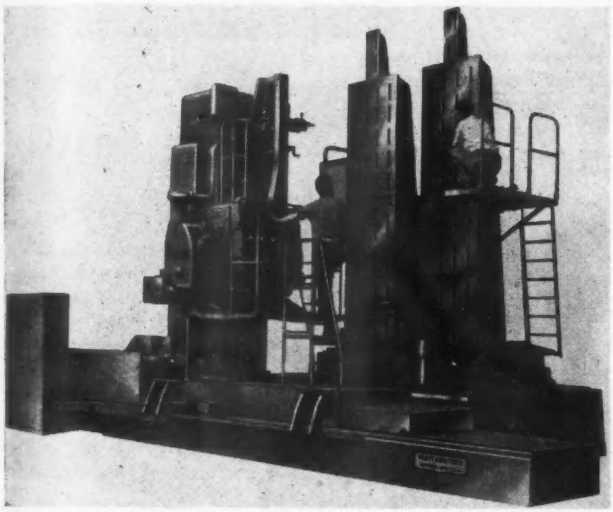
E-192—New Type Keller Machine

A recent development of Pratt & Whitney, Division Niles-Bement-Pond Co., W. Hartford, Conn., is the Type BG-22 Keller machine. Like other Keller machines (both smaller and larger) the Type BG-22 is a powerful and accurate milling machine that is controlled by a sensitive tracer and operated by simple electrical circuits. It reproduces automatically in metal the shape of a master form or model. The job may be either profiling in two dimensions or the reproduction of impressions and reliefs in three dimensions. In each case, as the tracer passes over the master form, the cutter duplicates its path in the work.

The electrical control of the Pratt & Whitney-Keller BG-22 provides continuous automatic speed variations and is said to permit machining from models at higher speeds and with greater accuracy than heretofore possible.

Complete control of the machine from one main operating station on the spindle head is secured by concentrating all controls in one panel at this station. An upper platform or station is provided above the main station for convenience of the operator when setting the tracer and when making other setup adjustments. A panel of momentary electrical controls is provided in the tracer bracket at this upper station. All starters, relays and other electrical apparatus necessary to the operation of the machine are concentrated in one control cabinet permanently mounted at the left end of the machine bed.

Operating from any conventional polyphase 50 or 60 cycle a-c source of power, the BG-22 has a horizontal travel of 120 in., a vertical travel of 60 in., and an 18-in. transverse travel with an additional six in. obtained by means of transverse spindle adjustment. The table working surface is 150 in. by 92 in.; standard spindle speeds range in 14 changes from 20 to 1200 rpm; horizontal and vertical feed rates range from ½ to 30 ipm; horizontal and vertical fast traverse rates are 250 ipm; and transverse travel rates range from three to 30 ipm. Automotive body dies up to 10 ft long and five ft high can be handled in the new machine.



Type BG-22 Pratt & Whitney - Keller machine

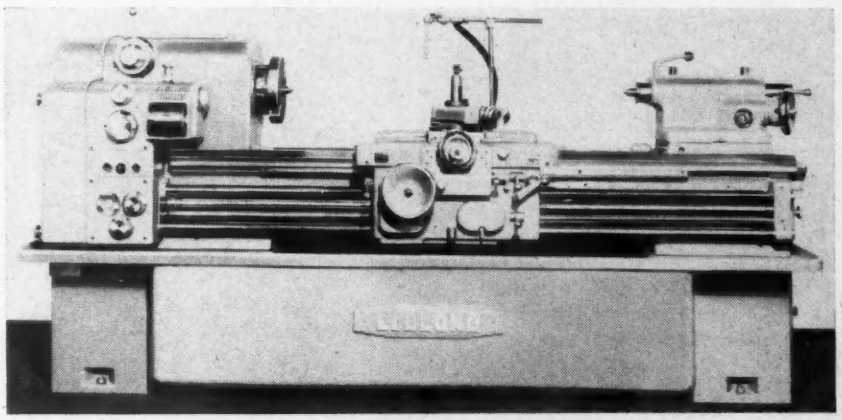
E-193—LeBlond Tool Room Lathe

An unusually wide range of spindle speeds and increased ease of operation are the outstanding features of the new 16-in. LeBlond Model RT tool room lathe manufactured by the R. K. LeBlond Machine Tool Co., Cincinnati 8, Ohio. Over 300 speeds ranging from six to 1500 rpm are controlled by a speed adjuster unit, and more than 100 speeds may be obtained in each of three ranges without stopping the spindle. Other engineering advances which add to ease of operation are: Universal power rapid traverse which moves carriage, cross slide, and tailstock; the totally-enclosed universal quick change box, fitted with a revolving index plate on feed box which contains instructions for obtaining five different types of 60 threads and leads each; automatic lubrication throughout headstock, feed box, and apron which requires little maintenance attention.

Additional new lathe features built into the LeBlond Model RT include: Combination gear-belt drive headstock which provides spindle speeds in three ranges; the combined feed apron which has special arrangement for connecting length and cross feeds for cutting steep tapers in connection with geared type taper attachment; the thrustlock tailstock with worm and rack construction which provides full length bearing support for spindle barrel; and L-shape bed which supports entire headstock base and which is fitted with replaceable flame hardened and ground steel bed ways front and rear.

The variable speed drive with which this lathe is powered consists essentially of four elements: Speed control units, 7½ hp adjustable speed main drive motor, speed adjuster unit with rheostat, and motor generator. This drive replaces brakes and clutches; provides plenty of torque with controlled acceleration for all starting conditions, and stops quickly through dynamic braking. Motor may be stopped and started without interfering with the speed setting.

The three-purpose speed adjuster unit consists of shifter for shifting to any one of three drives, speed selector dial for varying the speed of the main drive motor, and a button for jogging the main drive motor.



LeBlond 16 in. model RT tool room lathe

NEW Production and Plant EQUIPMENT

For additional information regarding any of these items, please use coupon on page 60

E-194—Tool and Die Milling Machine

The Cincinnati Milling Machine Co., Cincinnati, Ohio, announces its new 8 in. x 18 in. tool and die milling machine, which has been designed for rapid production of plastic molds, permanent molds, metal patterns, die casting dies, and small drop-forging dies.

The general structure of the machine is of the knee and column type, the column being truncated to provide for the turret and ram type mounting of the spindle head. Castings are thoroughly ribbed for maximum strength and rigidity. The knee is a box-section shape of heavy proportions and an apron type extension provides additional length of bearing on the column.

The tank, pump, motor, and relief valves comprising the hydraulic power unit are housed within the machine column. The hydraulic circuit involves only three hydraulic lines between the pump unit and the tracer mechanism.

A sensitive hydraulic tracer mechanism provides automatic duplication of intricate shapes with a high degree of accuracy. Tracer finger contact pressure is very light to permit the use of wood, plaster of paris, or other soft, easily worked materials for the master shape.

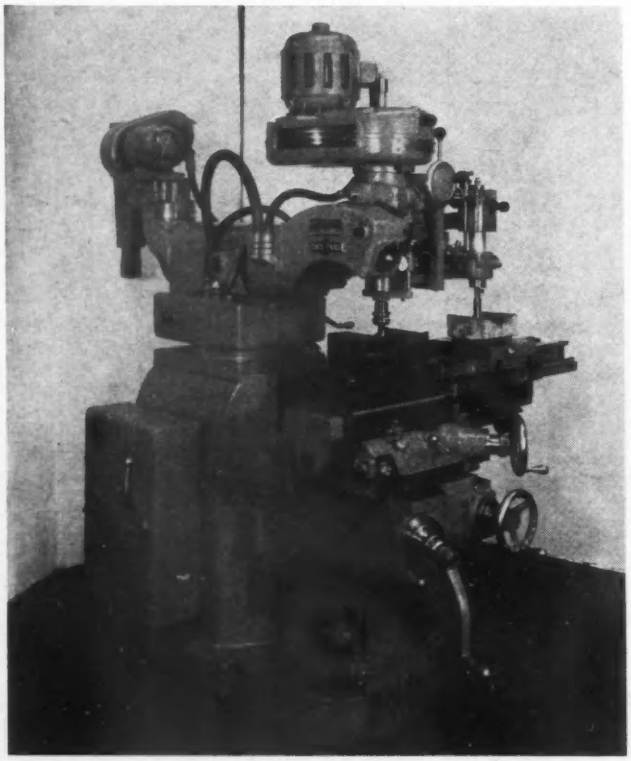
The tracer mechanism can be quickly disconnected from spindle carrier by a single bolt for general vertical milling operations. If desired, tracer mechanism can be entirely removed from the spindle carrier and mounted on a supporting bracket on the column without disconnecting any hydraulic lines.

The spindle carrier is mounted on a transversely adjustable ram, the rear portion of which is provided with a mounting surface for a slotting attachment. The ram is in turn mounted on a swiveling turret which permits the slotting attachment to be instantly swung into position over the machine table, thereby eliminating the necessity for another set-up on jobs requiring slotting operations. This attachment is universally mounted on a double swivel and has its own individual motor drive.

A wide range of angular milling jobs is made possible by a double swivel arrangement of the spindle head, in which the head swings on segments of circles, the centers of which lie close to the tip of the cutter. Hence cutter remains close to original position even when swiveled to maximum angle.

Adjustable limiting stops, with micrometer screw adjustment, are provided for saddle and table movements for accurate positioning of slides for repetitive cuts.

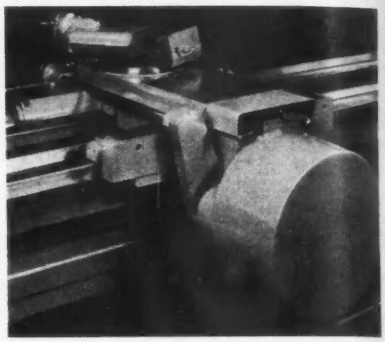
Ten spindle speeds are available, ranging from 225 to 4000 rpm. The spindle is driven by a single vee-belt and speed changes are made by means of a two-speed motor and a pair of five-step sheaves.



Cincinnati 8 in. x 18 in. tool and die milling machine

E-195—New Monarch Lathes

Several new and unusual lathes have recently been added to the line of the Monarch Machine Tool Co., Sidney, Ohio. Among them is a 13-in. Monarch Mona-Matic lathe which goes through the machining cycle automatically; loading and unloading with no more attention required than keeping



Monarch constant surface cutting speed attachment

the magazine filled with work pieces. This permits an operator to tend a battery of such machines.

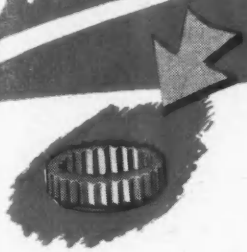
Basically the machine is a 13 in. by 30 in., 2000 rpm, Monarch Mona-Matic lathe. A swiveling type B "Air-Tracer" is mounted on the front carriage with the template rail extending along the machine immediately in front of the apron. Adjustable stops on the front vee of the bed control the extent of the longitudinal feed and rapid traverse return through the medium of switches enclosed within the ends of the apron. At the rear is mounted the automatic, air-operated loader. The tailstock is also air-operated, thereby simplifying the timing of the advance and withdrawal of the spindle with the action of the loading arms.

The entire cut is performed by a single cutting tool, "Air-Tracer" guided, which turns diameters, tapers, undercuts and chamfers. The sequence of operations is repeated on succeeding work pieces until such time as the operator stops the machine by depressing a control button at the front.

Another new Monarch development is the 18-in. by 48-in. Model 60 Toolmaker's lathe with a constant surface cutting speed attachment. This machine retains all of the features of the Series 60 Toolmaker's lathe and in addition provides constant surface cutting speed over a range of diameters from 2½ in. to 10 in.

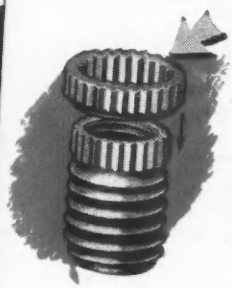
To provide this feature, a 5 hp 4 to 1 d-c motor is used in the conventional cabinet leg. A motor generator set is used for conversion of alternating to di-

This ring LOCKS Inserts or Studs to Parent Materials



Rosán Locking System prevents loosening or turning—even under vibration

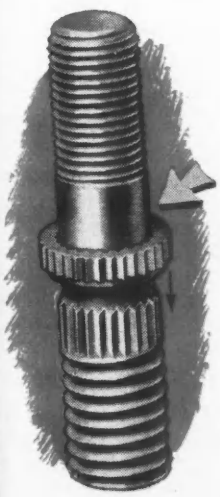
Studs and inserts become an integral part of the parent material with the Rosán Locking System. A ring, serrated both inside and out, locks its inner teeth with the mated collar on the stud or insert, and the outer teeth broach their way into the parent material. Result—a completely permanent installation that can't loosen or turn—yet can be removed easily, if desired, without injuring the parent material.



FASTENERS CAN'T PULL OUT OF SOFT MATERIALS with this Threaded Steel Hole

Rosán Inserts . . . give soft materials the strength of a steel tapped hole to hold fasteners in position under both tension and torque. A serrated ring locks the insert to the parent material so that it can't loosen, turn, or pull out of aluminum, soft metals, plastics or wood.

This threaded steel hole can be removed easily with an ordinary drill and any simple wedging tool—and replaced easily—without disturbing the parent material.



ROSÁN STUDS STAY TIGHT

Rosán Studs . . . can't loosen or turn—even under vibration—because the serrated ring locks the stud to the parent material. Rosán Studs can be removed and replaced easily—with simple tools.

Write today for a catalog showing applications of Rosán Inserts and Studs made by National.

National
HEADED AND THREADED
PRODUCTS

THE NATIONAL SCREW & MFG. COMPANY, CLEVELAND 4, OHIO

NEW Production and Plant EQUIPMENT

For additional information regarding any of these items, please use coupon on page 60

rect current. The rheostat to control the speed of the driving motor is mounted on the back of the carriage and is manually controlled by the dial to the right of the cross-feed screw handle. This dial is graduated from 2½ in. to 10 in. When set at 2½ in. the motor is running at full speed and the headstock will then give the speeds shown on the speed plate.

When a facing operation is to be performed, the operator selects the proper one of the 16 speeds for the diameter at the start of the cut, turn the dial to the same diameter, engages the rheostat with the screw feed by a convenient lever, and the machine will provide constant surface cutting speed from 2½ in. to 10 in. diameter. When facing below 2½ in. diameter, the motor is at the maximum speed of 2400, and when over 10 in. diameter, the minimum speed of 600 is automatically provided. This unit also provides constant surface cutting speed when turning or boring, when the tool is being set for various diameters.

When not in use in automatic fashion, it provides infinitely variable speeds from the top of the spindle speed range to one-fourth of the lowest speed.

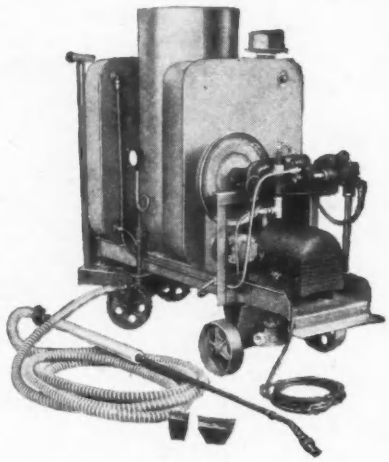
In addition to these new machines, Monarch is introducing a 32-in. Model 150 engine lathe, developed to provide more than average swing, plus sufficient power to remove stock much more rapidly than possible on existing Monarch machines. A separately mounted motor-generator set converts alternating current to the direct current required by the 50 hp, 600 to 1200 rpm motor. Speeds of 9 to 1200 rpm are provided. There are seven speed ranges, six of them being through back gearing.

The machine is available from 60 in. to 276 in. between centers in increments of 24 in. Net weight of the 84-in. size, including all electrical equipment is approximately 50,000 lb.

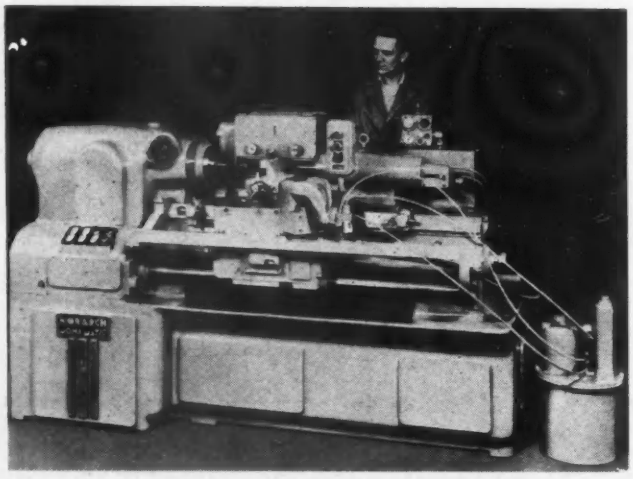
E-196—All-Purpose Steam Cleaner

The new "Utility" model Hypressure Jenny, a full powered, extra-heavy duty, all-purpose steam cleaner, is the latest addition to the line of the Homestead Valve Manufacturing Co., Coraopolis, Pa.

In addition to super cleaning capacity, the new unit is reported to feature instant starting, ready to clean in less than a minute from a cold start; simple welded unit construction; complete accessibility of all working parts; continuous electric spark ignition; nonclogging heating coil; and simplified pressure-atomizing oil burner. The new model will be available with either oil or natural gas burners, and electric motor or gasoline engine drive.



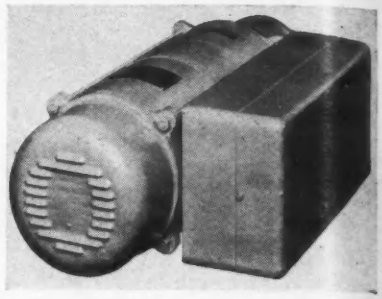
Utility model Hypressure Jenny



Monarch Mona-Matic lathe

E-197—Electronic Amplidyne

A new electronic amplidyne consisting of a high-gain balanced d-c electronic amplifier and a motor amplidyne is offered by the Motor Divisions of the General Electric Co. The new equipment is a high-capacity amplifier which is useful in many types of motor control where precise regulation of current, voltage, and speed is necessary.



G-E electronic amplidyne

Designed for use as a regulated adjustable-voltage power supply for d-c motors up to 1½ hp and as a regulated exciter for larger adjustable-voltage drives up to 200 hp, the new equipment has an output of 1½ kw, 250 volts. It is arranged for use on either a 220- or 440-volt, 3-phase, 60-cycle power supply.

The electronic amplidyne makes possible a speed range of 20 to 1 or greater. It is said to maintain speed closely at any setting, regardless of load conditions. It assures smooth, rapid acceleration and reduces starting shock on the driven machine by means of current limit control of acceleration and stalled current.

Quick stopping without undue stress to motor or driven load is provided by suicide braking utilizing current limited regeneration. The equipment satisfactorily maintains speed on overhauling loads where the motor is required to absorb power and act as a brake during part of the loading cycle. It is readily adaptable to programming and processing control.

Design features include a completely balanced amplifier which is insensitive to line voltage changes; an industrial electronic amplifier with hinged panel; a circuit which is easily adjusted for various operating conditions, and a locking device which maintains settings once the circuit has been adjusted. Double end ventilation is provided.

E-198—Truck with Special Attachment

The Yale & Towne Manufacturing Co., Philadelphia Division, has designed a special boom-and-hook attachment for use where large, heavy, and awkward castings or weldments must be handled. It handles loads which are too bulky for the usual fork or platform truck.

VICKERS Variable Speed HYDRAULIC TRANSMISSION

1/2 Horsepower

(PATENTED)

PRICE $75.00

Here is a compact, sturdy, variable speed hydraulic transmission for machinery drive. Any speed from zero to 1750 rpm—*in either direction* can be obtained without reversing the driving motor.

Effortless finger tip speed adjustment over the entire range is obtained by the handwheel control and the selected speed remains constant. A hydraulic servo control mechanism is also available. The full output torque is available throughout the speed range and the built-in automatic overload protection permits stalling without causing damage.

The Vickers hydraulic transmission is automatically pressure lubricated by the power transmitting medium (oil) for long and trouble-free operation.

Contact the Vickers Sales Engineering and Service Office nearest you for complete information.

ASK FOR BULLETIN No. 47-40

VICKERS Incorporated
DIVISION OF THE SPERRY CORPORATION
1428 OAKMAN BOULEVARD • DETROIT 32, MICHIGAN

Sales Engineering and Service Offices: ATLANTA • CHICAGO • CINCINNATI • CLEVELAND • DETROIT • LOS ANGELES • NEWARK • PHILADELPHIA • ROCKFORD • ROCHESTER • SEATTLE • ST. LOUIS • TULSA • WASHINGTON • WORCESTER

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

NEW Production and Plant EQUIPMENT

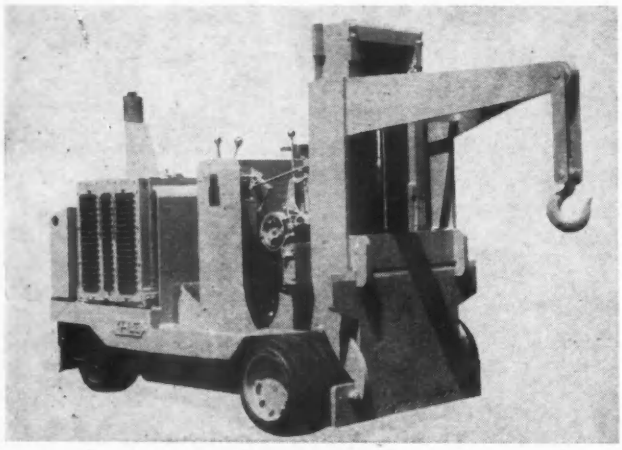
For additional information regarding any of these items, please use coupon on page 60

The boom is detachable, and the truck can be equipped with forks for normal lift-truck duties if the handling of large pieces is intermittent and does not require full-time truck duty.

The hook has an outreach of approximately 4 ft and can lift loads up to 18,000 lb.

The channel uprights tilt forward or backward to prevent the load from spilling or striking the truck when negotiating grades. Grades of 7 per cent (up or down) are readily transversed by the truck.

Additional features include: Rear steering wheels equipped with 8 in. by 22 in. tires; double width front drive wheels, each equipped with two 8 in. by 22 in. tires; four forward speeds in addition to the reverse speed; and Cam-O-Tractor control operating in conjunction with a time delay relay to automatically govern the speeds of the truck.



Yale truck with special boom-and-hook attachment

E-199—Platform Utility Truck

A platform utility truck designed for odd-jobs in material handling has been introduced by Truck-Man, Inc., 1416 W. Ganson St., Jackson, Mich. The platform is 3 ft by 5½ ft—and will handle awkward, manually loaded materials up to its 1500-lb capacity.

The Truck-Man Utility is recommended by the manufacturer as a mobile unit which can be equipped with permanent fire fighting apparatus for plants and small airports, or with factory maitenance tools, pressure greasing unit or other service facilities.

The truck should be useful wherever bulky loads within its capacity are handled. It has full high and low speed in forward or reverse and power is a Briggs & Stratton 2¼ hp gasoline engine. The Truck-Man Utility will turn in its own length. Specifications are: Length overall, 108 in.; wheelbase, 72 in.; ground clearance, 5½ in.; loading height, 16 in.; tires, four 6-ply pneumatic industrial tires, size 14 in. by 4½ in.

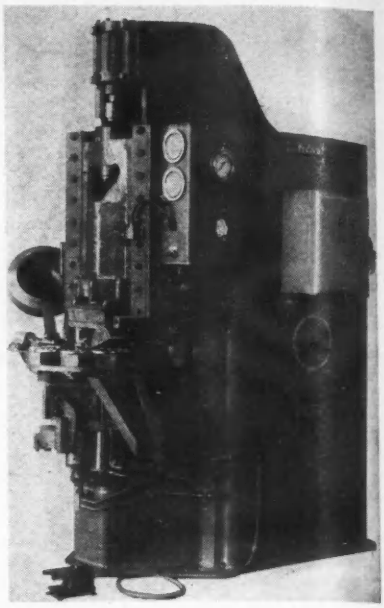
E-120—Hydraulic Projection Welder

A high production welder, designated as the Federal PHA-12 hydraulic projection welder, for welding gasoline engine push rod assemblies at the rate of 1200 per hour, has been introduced by the Federal Machine and Welder Co., Warren, Ohio.

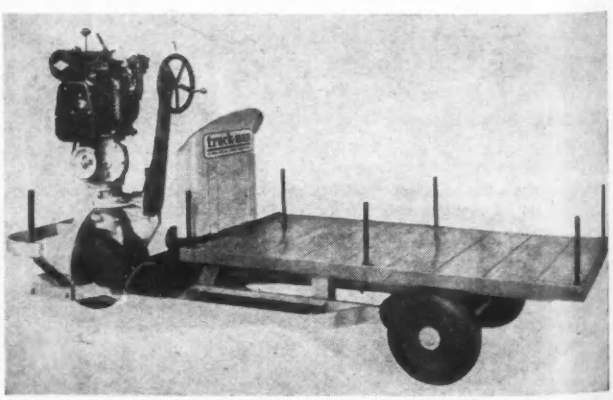
The welded push rod assemblies consist of two parts, a round alloy steel disk which forms the head, and a forged steel cylindrical stem containing a blind hole, the open end of which is projection welded to the disk.

The hydraulically-operated, eight-station automatic dial feed table is equipped with positive indexing and locking devices. The unit is furnished with eight welding fixtures consisting of solid type, copper alloy dies with insulated locators for positioning the disks for any one of the various size tappet assemblies which the machine is capable of welding. Dies are designed for quick changeover from one size to another. The machine is also equipped with an automatic hopper feed for feeding the disks continuously. This consists of a hopper, motor-driven agitator and hydraulic selector mechanism synchronized from the index table.

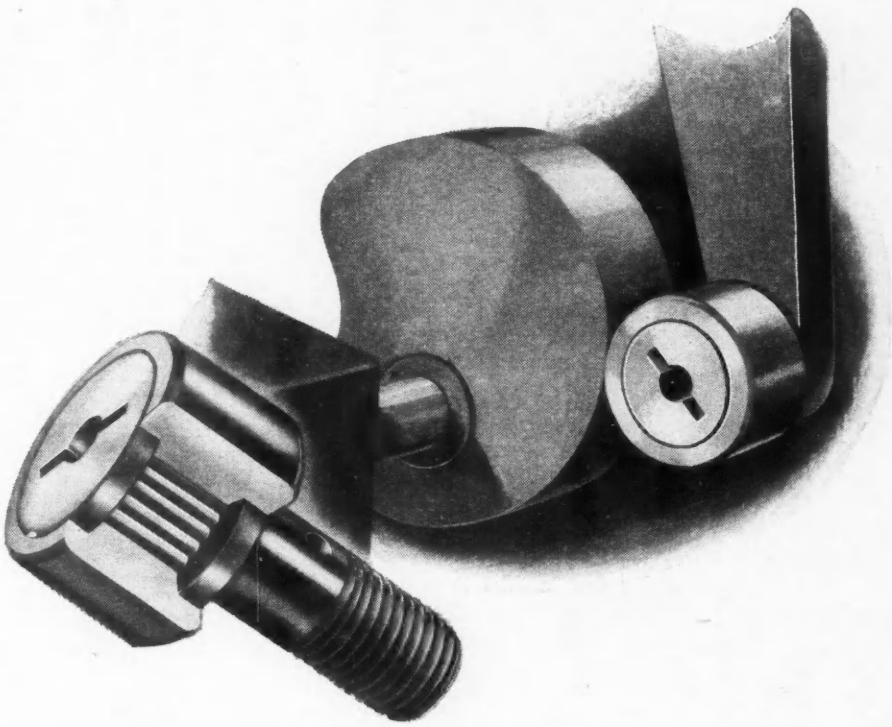
The operator manually places the push rod in the die. The die moves around under the disk feed chute where the disk is clamped in place by a locator. The parts then move around under the welding head where the weld is completed while additional dies are being loaded. Upon completion of the weld, the dial feed mechanism rotates to the next station where the completed assembly is ejected into a chute and the next loaded die takes its position under the welding head. The welder is equipped with a 400 kva welding transformer, having water cooled. cast copper secondaries wound for 380-volt, 60-cycle alternating current and is provided with 16-point series-parallel heat regulation.



Federal PH4-12 hydraulic projection welder



Truck-Man Utility truck



For dependable "follow-through"...

in cam follower applications, wear must be kept to a minimum . . . a problem which grows with increasing loads and speeds. The anti-friction efficiency of

Torrington Cam Follower Needle Bearings...

helps to assure continued accuracy of operation of many types of machines. They have a high radial capacity provided by a full complement of small diameter rollers—backed up by sturdy outer races. They are compact in design, occupy little space, retain and distribute lubricant effectively to all surfaces.

Torrington Cam Follower Needle Bearings are made in a wide range of sizes, one of which may be the solution to your cam roller problem.

THE TORRINGTON COMPANY

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TORRINGTON BEARINGS

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NEW Products

For additional information regarding any of these items, please use coupon on page 60

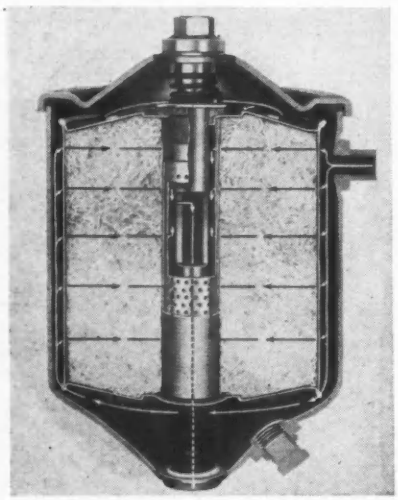
F-126—Two New AC Products

A new line of "Five Star" high efficiency oil filters has been developed by AC Spark Plug division of General Motors.

The new line contains a glass cloth covered collector tube trap, an exclusive AC development. The glass cloth trap is acid-proof and will not deteriorate when attacked by engine oil acids, by products of combustion. The glass cloth is an added, permanent filtering material.

Long-fibre virgin cotton, ram-packed, constitutes the other filtering material. The filters have an extra heavy metal case and a large drain plug for easy removal of sludge.

AC engineers declare that the new filter incorporates some of the features



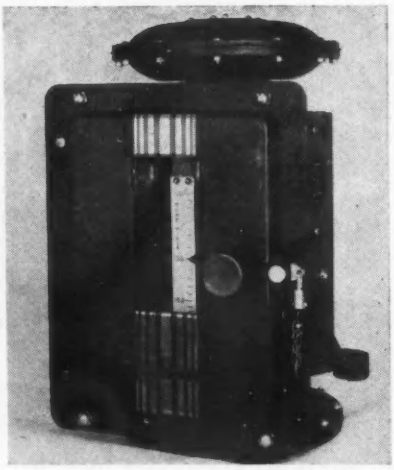
Cut-away view of Five Star filter

developed by AC for its military oil filters.

Another new AC development is an improved line of spark plugs with insulators of corundum, a crystalline form of alumina. These new plugs are said to have a wider heat range and to withstand temperature shock better as well as resisting fouling.

F-127—Air-Fuel Ratio Controller

Complete L&N temperature and combustion control systems produced by Leeds & Northrup Co., Philadelphia, Pa., for large industrial furnaces now include a new air-fuel ratio controller which has the features of simplicity, accuracy and sensitivity. Like the Micromax pyrometers and L&N furnace pressure controllers with which it operates, this controller employs electric-motored valve drives—needs no hydraulic piping.



L & N air-fuel ratio controller

This controller is a balance-type instrument, having ample flexibility to meet any operating condition. Its ratio can be adjusted manually for operation with fuels of various Btu content. As fuel flow changes, the instrument maintains air-fuel ratio constant at the desired control point. Or, it can provide automatic variation of ratio, increasing or decreasing the per cent of air at reduced fuel flows.

The instrument mounts readily on the furnace panel along with other L&N control instruments.

F-128—Bright Cadmium Plating Process

Announcement is made by the Hanson-Van Winkle-Munning Co., Matawan, N. J., of a new and improved bright cadmium plating process—the Cadux HS process.

Advantages of the new process are said to be: A remarkable increase in brightness of deposit; a higher tolerance for impurities; higher permissible current densities; and improved covering power and appearance on rough and imperfect surfaces. Under optimum conditions, the deposits are mirror-bright as they come from the plating solution. A short bright dip may be used in order to compensate for variations of current distribution because of limitations in racking or because of the intricate shape of the article being plated. It also minimizes finger marking during assembly operation.

One of the features of the Cadux HS process is its tolerance for impurities. The range of the bath is from 20 to 40 amp sq ft with an optimum current density of 30 to 35 amp sq ft in still plating. With agitation, current densities up to 70 amp sq ft have been employed.

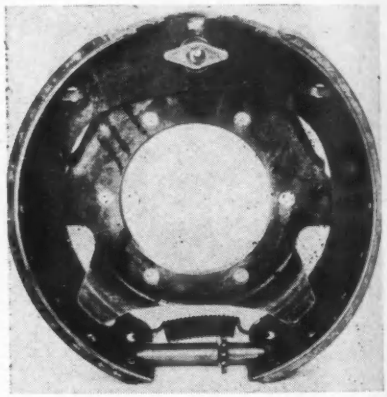
Existing solutions can be converted to Cadux HS by adding Cadux HS conversion salts and concentrated Cadux HS brightener along with the proper adjustment of metal and free cyanide concentration in the bath.

F-129—Bendix Brakess for Tractors

A new addition to the line of Bendix brakes for farm and industrial tractors and agricultural implements is the 11 in. by 2 in. mechanically-actuated tractor brake now in production in the plants of the Bendix Products Division, Bendix Aviation Corp., at South Bend, Ind.

The new brake is of the single anchor, duo-servo type, incorporating the "Centermount" feature in the main supporting member. Instead of the usual backing plate and anchor pins with "off center" loading, a rigid spider plate supports the shoes. This spider plate is in line with the center of the shoes, with the webs taking the torque loads directly in line with the supporting member.

Adjustment to compensate for lining wear is provided at the end of the shoes



Bendix 11 in. by 2 in. mechanically actuated tractor brake

opposite the anchor pin. The conventional type star wheel can be rotated with a brake adjusting tool or an ordinary screw driver.

The new Bendix brake is readily adaptable to many installations. One installation calls for the cam as an integral part of the pedal shaft. The individual brake pedals are mounted side by side, enabling the vehicle operator to apply both brakes simultaneously. When operated separately the brake can be applied to assist in turning the tractor. Other installations can be made where the brake is actuated by means of an equalizing cam, independent of the pedal shaft.

The design of the brake is said to be very effective with a minimum of pedal effort for maximum braking by the operator and to all purposes the forward and reverse braking are approximately the same.

POWER

EXIDE BATTERY POWER MEANS... DEPENDABLE DIESEL CRANKING

YOU can count on Exide Batteries for dependable performance even where the Diesel cranking job is extra tough. That's because they are built for this specific task. They provide the extra power and speed that Diesel cranking demands.

Exide Batteries are doing a top quality cranking job on Diesel equipped trucks, buses and off-the-highway equipment . . . on ships and railway locomotives . . . in power plants and many other applications. And whatever the job, you can count on Exide Batteries for dependability, long life and ease of maintenance.

Write today for a FREE copy of the Exide Catalog on Heavy-Duty Batteries. It gives you catalog data and information on how to get the most from your Diesel Cranking Batteries.

Exide
BATTERIES

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia 32 • Exide Batteries of Canada, Limited, Toronto

NEW Products

For additional information regarding any of these items, please use coupon on page 60

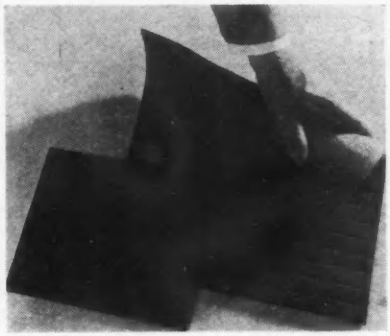
F-130—New Line of Metal Cleaners

A new line of metal cleaners has been brought out by the Parker Rust Proof Co., Detroit, Mich. The three classes of Parco cleaners for steel, zinc and aluminum include emulsion types, acid types, and alkaline types. They are specialized cleaners to meet varying specifications and conditions. Parco cleaners are formulated to make hard water suitable for cleaning, to rapidly remove soil from metal surfaces, to condition them for fine, dense Bonderite coatings, to remove rust and grease prior to painting, and to provide easier control and greater economy.

F-131—Heavy-Duty Floor for Vehicles

A new heavy-duty floor for use in the transportation field is being placed on the market by the Industrial Division of the Armstrong Cork Co., Lancaster, Pa. Trade-marked Acolon, it is a wear-resistant synthetic polymer calendered onto a quality burlap backing. It presents, in addition to long wear, a non-skid surface, dimensional stability, a wide color range, and easy installation.

Seven color choices are available, most of them in both ribbed and plain styles.

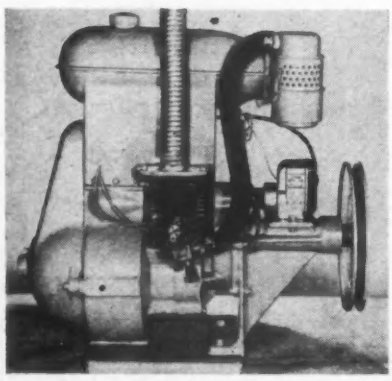


Armstrong Acolon floor covering for buses and other vehicles

The ribbed patterns are offered in rolls 60 in. wide, .140 in. thick, and may be obtained in black, green, blue, brown, or terra cotta. Plain colors are to be sold in rolls 72 in. wide, .125 in. thick, in black, green, blue, brown, white, and red.

The new Armstrong product is a heavy-duty material and is recommended by the manufacturer for transportation floors which undergo constant daily traffic.

F-132—Small Aircooled Engine



Graham-Paige Motors Corp., York Pa., offers this compact, lightweight stationary gasoline engine rated at five hp. The new engine known as the "Frazer," is equipped with an impulse-coupled magneto and operates on the two-stroke principle. Mounted on a metal base plate and fitted with a V-belt pulley power take-off, the engine occupies less than three sq ft of floor space. It is essentially the same as the engine used in Graham-Paige's Rototiller farm machines.

F-133—Case for Welding Outfit

The Air Reduction Sales Co., 60 E. 42 St., New York 17, N. Y., is introducing an improved carrying case for transporting a welding or cutting outfit to the job in an orderly manner. Torch, tips, regulators, hose, gloves, goggles, wrenches and miscellaneous equipment can all be compactly arranged in this new case.

The Airco carrying case's construction is of 22 gage cold rolled steel with flush double lock seams. Reinforced ends and cover are especially paneled for rigidity and strength. Other features of the new carrying case are a ripple exterior finish of baked enamel; handle-equipped lift-off tray; extra-heavy duty bolt catches and a padlock hasp.

The carrying case has a net weight of 10½ lb. Its dimensions are 22 in. long, eight in. wide and nine in. deep.

F-134—Three New Carbide Products

Three more cemented carbide products—solid disks, disks with holes, and solid strips—are now available as standard stock items from the Carboloy Co., Inc., of Detroit, Mich.

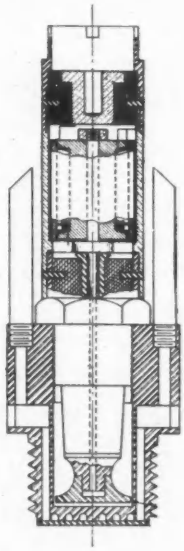
The solid disks are furnished in 10 sizes ranging from ⅛ in. diameter by 1/16 in. thick, up to 1 in. diameter by 3/16 in. thick. These disks are used for wear-proof inserts in gages of various types as well as in micrometers and comparators; for tool-makers' flats; and for the wear-proofing of tools and equipment in general.

There are 12 sizes of the Carboloy disks with holes, ranging from ¼ in. OD by ⅛ in. ID by .030 in. thick, to 1¼ in. OD by 5/16 in. ID by .060 in. thick. Widest use to date of these disks has been in the making of small solid carbide slitting saws. The disks with holes are also used as nozzle inserts for various types of sprayers; as small orifices where undue wear is encountered; etc.

The solid carbide strips are available in 21 sizes ranging from 1/16 in. by ⅛ in. by 3 in. up to ¼ in. by ¾ in. by 6 in. These Carboloy strips are currently finding their greatest use as hard, wear-proof facings on the working surfaces of centerless grinder workrests.

F-135—Indicator for Measuring Pressure

An improved indicator for measuring static and dynamic pressures is being manufactured by Photocon Research Products, 1062 N. Allen Ave., Pasadena 7, Calif. The pressure sensitive pick-up is made of Invar steel and is water-cooled for high-temperature applications. The over-all frequency response of the capacitance pick-up and associated electronic equipment is said to be flat from 0 to 10,000 cps. Galvanometer or cathoderay oscillographs normally are used for recording.



Cut-away view of Photocon indicator

This instrument is being used for measuring pressures in automotive, aircraft, Diesel, rocket and jet power plants, as well as for studying hydraulic pressures and pump characteristics.

USER REPORT:

"Our average brake maintenance cost .....$0.00085 per mile."

DAILY FREIGHT SERVICE

SCHMIDT TRUCK LINES

FARGO
Dial 6211

Duluth 2, Minnesota
July 10, 1947

Warner Electric Brake Mfg. Company
Post Office
Beloit, Wisconsin

Gentlemen:

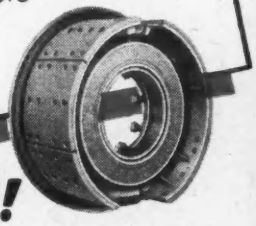
During the past twelve months we have kept maintenance cost records on all our trailers. Brake maintenance, including parts and labor, averaged $51.00 per unit and each unit travelled more than 60,000 miles. Our average brake maintenance cost was $0.00085 per mile.

We are satisfied that no other type of power brake could have given us the low maintenance cost of your electric brakes. However, we would like to know if our costs are comparable with other fleets using Warner Electric Brakes.

Your brakes have been used exclusively on all our equipment since 1932.

Very truly yours,

SCHMIDT TRUCK LINES
By Adolph Muehring



NEW!

Warner Electric Brakes of 2-shoe construction in sizes 16½" x 5", 16½" x 6" and 16½" x 7". A really new concept of super-stopping power. Ask about them.

WARNER ELECTRIC BRAKES
USED EXCLUSIVELY BY US SINCE 1932!

THE low-cost maintenance and long-time satisfaction experienced by SCHMIDT TRUCK LINES is *not unusual — it's just good average performance* for Warner Electric Brake equipped fleets!

Warner Electric Brakes are specifically engineered to meet every trailer braking need. No other brakes equal their rugged construction, long lining life, positive control and dependable performance even under the most severe conditions, of rain, snow and ice.

Being activated by electricity, they are instantaneous in action — a vital factor in emergencies.

CHECK YOUR BRAKE PERFORMANCE AND MAINTENANCE COSTS! If you want maximum safety plus economical performance, standardize on Warner Electric Brakes. Write for illustrated literature explaining their many advantages.

WARNER ELECTRIC BRAKE MFG. CO.
BELOIT, WISCONSIN

WARNER
THE ORIGINAL AND PROVEN
ELECTRIC BRAKES

SINCE 1927

PUBLICATIONS AVAILABLE

Publications listed in this department are obtainable by subscribers through the Editorial Department of AUTOMOTIVE INDUSTRIES. In making requests please be sure to give the NUMBER of the item concerning the publication desired, your name and address, company connection and title.

D-102—Resistance Welding Materials

Weiger-Weed & Co. Div. of Fansteel Metallurgical Corp.—A new 24-page booklet on resistance welding materials includes replaceable tips, water-cooled holders, seam welding wheels, special dies, electrodes and refractory alloys. The catalog lists specifications and prices and contains valuable information for users of resistance welding on such subjects as Recommended Electrode Materials for Spot Welding Similar and Dissimilar Metals, Helpful Tips for Better Welding, Spot Welding Low Carbon Steel, etc.

D-103—Electric Contouring Device

. R. K. LeBlond Machine Tool Co.—Bulletin EC-1 describes a new electric contouring device, which can be installed on any LeBlond Regal lathe.

D-104—Dialmatic Single Spindle Automatic Machine

The Cleveland Automatic Machine Co.—A 6-page bulletin illustrating and describing the new Model AB Cleveland Dialmatic. Complete information is given on design and constructions features, and specifications. Special attachments available are also listed.

D-105—Diecasting Machines

The Cleveland Automatic Machine C .—An attractive 4-page bulletin gives full details and specifications of the improved Model No. 400 High-Pressure, Hydraulic, Universal Diecasting Machine. The No. 200 Universal Diecasting Machine is described in a 2-page bulletin which includes design and construction features and specifications.

D-106—Industrial Wire Cloth

Reynolds Wire Co.—The story of wire cloth is given in an attractive booklet which pictures the various manufacturing operations at the company's plant and gives definitions and wire cloth terms, special weaves, etc.

D-107—Hydraulic Pumps

Hydro-Power, Inc.—Bulletin No. 471 gives information on the complete line of radial piston-type hydraulic pumps manufactured by the company. Dimensional charts for pumps rated from 1.25 radial gpm. to 185 gpm. are included, together with characteristic horsepower/volume/pressure curves. Three types of available control are described: constant pressure settings, with or without handwheel volume adjustment; automatic reduction of pump stroke at any desired point, and servo-reversing control.

D-108—Conveyor Systems

Allied Steel & Conveyors, Inc.—A new bulletin entitled Conveyor Systems illustrates and describes the various types of conveyors and conveyor installations made by the company. A mile-long conveyor system that handles a production product from beginning to end and an automatic metal cuttings salvage conveyor system are featured.

D-109—Centerless Belt Grinding

Porter-Cable Machine Co.—A comprehensive explanation of the centerless belt grinding method is presented in a new folder. Benefits derived from the centerless belt grinding method are discussed and illustrated. Complete specifications are included.

D-110—Tool and Die Milling Machine

The Cincinnati Milling Machine Co.—Publication No. M-1620 describes and illustrates the company's 8" x 18" tool and die milling machine. One illustration provides an index to operating controls and construction details; highlights of design are given together with a dimensional drawing of the machine. Specifications and extra equipment available are included.

(*Turn to page 92, please*)

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Automotive Industries,
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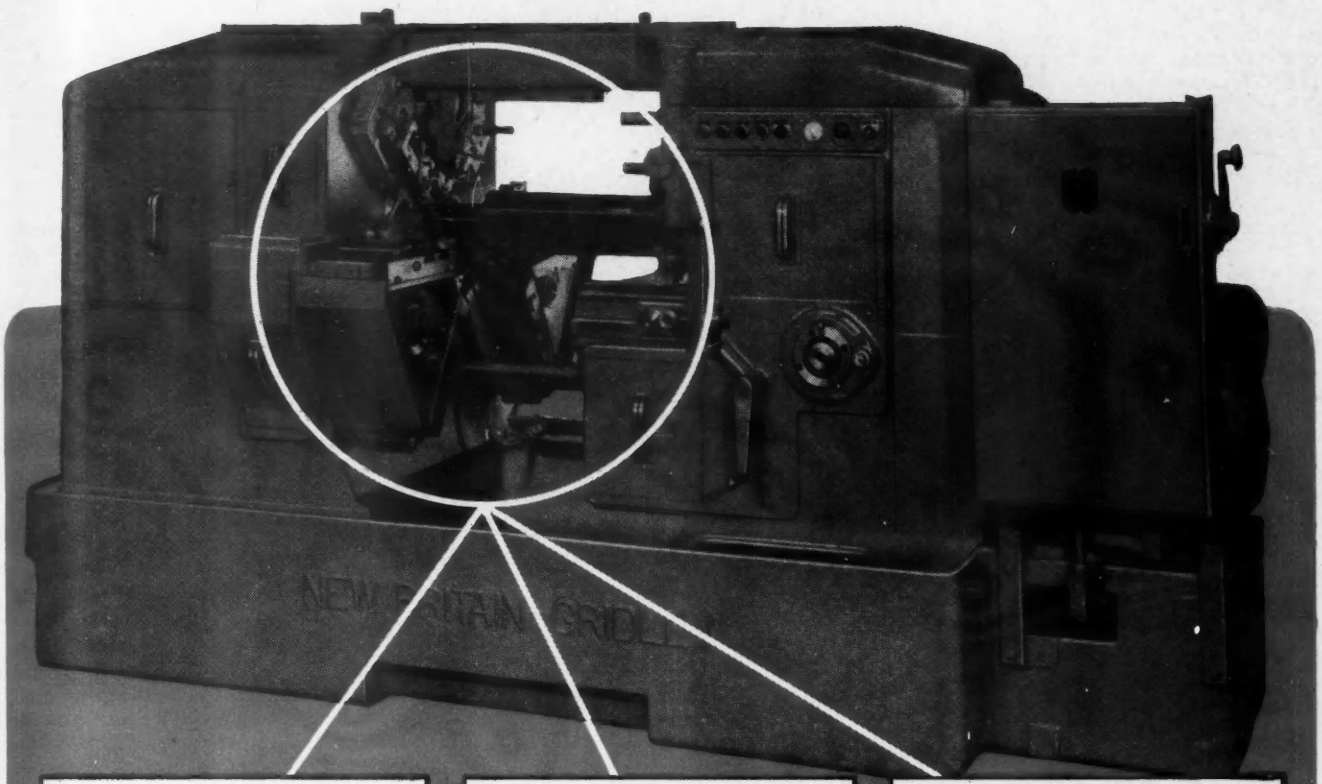
NEW BRITAIN'S NEW LINE OF SCREW MACHINES

Answers the Need for Lower Costs and Higher Productivity



QUICK SET UP

1. No cam to change for main tool slide. Strong, positive universal cam selects feed stroke without changing high point, stops or total stroke.
2. No cam to change when adjusting stock feed-out length.
3. Cross slide cams directly behind slides minimizing linkage. Remove three screws with cover and cams pull off.
4. Micrometer adjustment in both directions on all cross slides, all independent of stops.

SYMMETRICAL RADIAL TOOLING

1. Five heavy-duty forming slides and cut off slide evenly spaced about carrier making line of forming thrust identical in each position.
2. Tool holders interchangeable among forming slides, also on main tool slide.
3. Greatly increased chip clearance and capacity so essential with carbides.
4. Flexibility for auxiliary threading attachments. Accelerating drives in every position.

FOOLPROOF, AUTOMATIC OPERATION

1. Shoulder height, complete control panels at front and rear of machine.
2. Automatic stop shuts off machine and flashes red light when spindle is empty.
3. Program wheel on outside of powercase shows complete cycle of machine.
4. Machine stops if lubricating oil pressure is low.
5. Gage indicates when machine is operating at other than normal load.

Fast, powerful machines which will outperform anything modern tools will handle and anticipate future tool developments. These new machines with their initial and permanent accuracy also incorporate all the previous exclusive features by which NEW BRITAINS are recognized. To these qualities have been added new features, making it possible to accomplish quick setups where short runs are the rule. Built massive to handle the horsepower required for steady feeds for carbides on tough forming steel jobs, they are also designed for super high-spindle speeds, essential for brass and aluminum. Six spindles up to 2¼" capacity.

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NB

NEW BRITAIN

Automatics

THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN-GRIDLEY MACHINE DIVISION
NEW BRITAIN, CONNECTICUT

M-01062

Ford Modernizes Its Buying Methods

(*Continued from page 27*)

chasing Agents, handle all negotiations with suppliers. We have encouraged more frequent visits to supplier plants by our buyers and help them to utilize fully all of the resources of the staff in their dealings.

Our Sales and Advertising Division has done an outstanding job of merchandising accessories and we recently added a special accessory buyer with an extensive merchandising background, to work with this division and to do a sales-minded buying job.

Working Closely with Suppliers

Releasing the buyer's time so that he can work more effectively on buying and negotiations—together with a clearly defined policy of working closely with our suppliers has materially improved our supplier relations and we believe we're getting much better service and cooperation from them. Our policy is not just one of "Be nice to suppliers" but is intended to prove to each supplier that we believe we have a mutual interest in getting the best possible product at a sound price which gives us a low cost and him a reasonable profit.

The application of that policy begins at the reception lobby and continues from that point. Salesmen and representatives of suppliers are welcome visitors and we try to treat them that way. We have no "buying hours" and unless a buyer is tied up with another supplier, a visitor does not wait. He gets an interested audience and full cooperation. If what he has to offer can't be used, he is told why and—we hope—leaves with a good feeling for the company. If he has something of interest we stay with him, arrange for tests and for contacts with the engineering, manufacturing, sales or other divisions of the company. We do check him and his company carefully. We look into the record of the company from many standpoints such as reliability, financial stability, experience, facilities, production record, ability to keep promises, cost and profit record, etc., so that we can be certain the relationship will be mutually sound.

The changes so far made are only a beginning. Specifically, we plan to simplify and improve our follow-up activities by consolidating all follow-up in the Central Follow-up Department. At present, the follow-up on semi-finished materials and sub-assemblies, which are shipped to our manufacturing plants is being done by the buying departments. We plan to separate the follow-up and buying jobs as between purely clerical and bookkeeping work and assign clerks to that type of work. Our paper work and record keeping needs improving; we do too much paper work, and most of what we *must* do can be done in a still easier and simpler way. Our commodity research and purchase analysis techniques can be bettered and used to greater advantage by our buyers. We will continue to appraise personnel and to try to use their abilities more fully and to provide better training for all personnel, both on-the-job and other types so that we can develop more of our top men from within the company. For the purpose, we have started a full-scale buyer development program.

We, in purchasing, have a great opportunity to offer young men. We need well-thought-out plans for selection, training, development and promotion of our people. Unless we do develop such plans, we'll be in a poor position in the future. There just will not be a group of young able men pushing each of us—

(*Turn to page 64, please*)

Now all metals or combinations of metals may be scientifically degreased with the same solvent. You need not pay premium prices for special solvents for different metals. The new, improved BLACOSOLV is the most highly stabilized degreasing solvent for use in solvent vapor degreasers. It can be used over and over again without impairing its high qualities. BLACOSOLV is non-inflammable . . . has a low boiling point (188° F.) . . . Does not affect or stain even the most highly polished surfaces.

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BLACOSOLV DEGREASERS AND SOLVENT

NIAGARA METAL PARTS WASHERS

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NEW YORK, N. Y. TORONTO, ONT.

new

Use SAME BLADES and SAME LOCKS for all sizes of cutters

The GAIRING

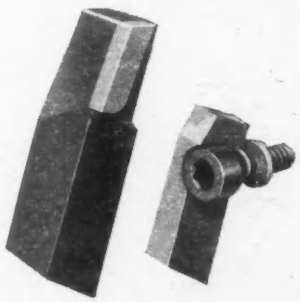
E-CON-O-MILL

Patent Applied For

A New Carbide Face Mill Made in Standard Sizes 5-inch Diameter and over

CUT DOWN YOUR TOOL INVENTORY

REDUCE DOWN-TIME OF YOUR MACHINES



Rigid tests under actual production have confirmed careful laboratory tests; this entirely new milling cutter has true one-piece rigidity under severe working conditions. Yet with all parts quickly and easily interchangeable, inventory costs and machine down-time are cut to an all-time low. Cutter bodies give full support to the entire projection of the blade, not only behind but also underneath.

The same blades are used for all sizes of cutter bodies. They are furnished diamond-ground to a gage, ready for work. They are made in three types, for cutting steel, for cast iron, and for non-ferrous materials. The assembled cutter need not be placed on a cutter grinder. The blades may be re-ground individually on an ordinary wet carbide grinder. When the cutter is set up in the machine, blades may be lined up against the cut in the work.

The same locks are used for all sizes of cutters. They are in one piece and remain attached to the cutter body when changing blades.

Write for illustrated folder which gives complete data and prices.

THE GAIRING TOOL COMPANY
21221 Hoover Road
Detroit, Michigan

Ford Modernizes

(*Continued from page 62*)

looking for opportunities to get ahead —and at the same time doing an outstanding job for our companies.

Selecting Suppliers

We have, as purchasing men, a second opportunity and responsibility—in selecting suppliers. Our choice will have a marked impact on the economy of the country and the development of small industries. We, in our daily work of placing business with suppliers, largely govern the growth of the suppliers' business. If we place most of our orders with large companies, the smaller businesses will get only the remaining low volume business. And few small businesses can develop and grow on that kind of operation. Much of our business must be done with the big companies. They alone have the facilities and the capacity to produce much of what we need. On the other hand, there is a very substantial part of our business which is being placed with the smaller concerns at comparable prices for equal quality and we often get better service.

It might be well for all companies to take a good look where they buy and make certain that they are duly considering the little fellows. Thirty per cent of total business today is done by small companies who in turn employ 45 per cent of the working force. With the stake of these people in mind we should consider our responsibility for maintaining a competitive economy. And small business is an important factor in that kind of economy. The potential ability of the small supplier to meet requirements should be given full consideration. If we buy all the things we need from big fellows—there won't be any small ones left one of these days.

Specify STROM BALLS

Hand Gauging of large diameter Strom Balls before packaging

When you specify Strom Balls you are sure of getting balls with the highest obtainable degree of finish, sphericity, precision—balls that give the very highest quality of service in any bearing equipment. This high degree of perfection is the result of Strom's concentration for a quarter of a century on metal balls exclusively and the perfection of the processes and workmanship necessary to produce them. Strom Steel Ball Company, 1850 South 54th Avenue, Cicero 50, Illinois.

Strom BALLS Serve Industry

Largest Independent and Exclusive Metal Ball Manufacturer

Delco-Remy

(*Continued from page 37*)

tote pan which may be seen on the floor. The discharged basket then moves to the loading station as shown.

One of the new lines for the assembly of distributors is shown in Fig. 3, which also gives a glimpse of an adjacent line in the background to the left. Feature of the distributor line is the fast-moving merry-go-round stock feeder conveyor in the center whose function is to transport the variety of component parts to the various assembly operators. In the foreground are the turntable ends of two of the merry-go-rounds. The assembly table consists of slower moving belt conveyors on each side of the table with operators closely spaced for maximum output.

Delco-Remy also has developed special machines and process stations for handling operations that previously required considerable hand labor. An example of this is illustrated by Fig. 4 which shows a specially designed unit found on the condenser line. Condensers are loaded by hand into the small fixtures on the conveyor; and at the press station in the foreground, the terminal is automatically crimped onto the lead. As the condensers move to the station at the right, the terminal is attached automatically to make a permanent connection. At the station just out of the view at the left, while the condensers move along the line to the right they pass through an automatic inspection station. As the lead enters the station current is passed through the condenser to assure proper electrical connections. If the condenser has a leak or is otherwise defective, it is automatically rejected and ejected from the fixture.

Petrol Terminal Buys Texas City Oil Refinery

The Petrol Terminal Corp., Philadelphia, recently purchased the American Liberty Oil Co. oil refinery at Texas City, Tex., from the WAA for $3,250,000.

General News

(*Continued from page* 23)

Packard Launches Campaign To Advertise 1948 Models

Although Packard Motor Car Co., like all other manufacturers, has a tremendous backlog of orders, it is currently embarking on the most extensive advertising campaign in its history. Built around the company's 1948 model, just introduced, the campaign will run in ten national magazines and 1523 newspapers, in addition to spot radio announcements over 300 stations in 100 key cities.

To Plan Safety For Industrial Trucks

The American Standards Association has initiated a new project, Safety Code for Industrial Power Trucks, B56, and has invited the American Society of Mechanical Engineers to serve as sponsor. Included in this new project are safety requirements relating to industrial power trucks, but excluding commercial motor vehicles intended for highway use.

Resume Wolseley Production

The largest prewar Wolseley model is now once again being produced; however, production is in limited quantities, and is principally earmarked for government and semi-official requirements. This model is the 3½-liter, six cyl, seven passenger limousine.

Ward Is New Vice Chairman Of Navy Industrial Group

J. Carlton Ward, Jr., president of Fairchild Engine and Airplane Corp., was elected vice chairman of the Navy Industrial Association at its recent annual meeting in New York City.

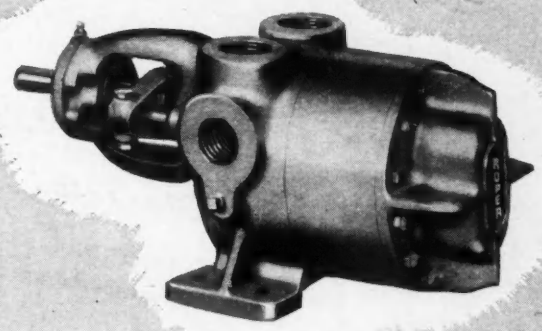
U. S. Rubber to Centralize Tire Tests in Lancaster, Cal.

The U. S. Rubber Co. has purchased 640 acres of land near Lancaster, Calif. from the WAA. The company's tire testing operations, heretofore scattered throughout the country, will be concentrated in this area.

Austin Motor Car Co. Buys Large Australian Body Firm

Austin Motor Car Company, Ltd., is reported to have purchased the controlling interest in Ruskin Motor Body Company, Ltd., one of the largest body building organizations in Australia.

Proved Roper Features *that insure* DEPENDABILITY



✓ Hydraulic self-lubricating principle prolongs pump life with less service attention. There is positive continuous bearing lubrication. Liquid pumped enters grooved bearings from pressure side, is drawn to suction side through grooves in opposite bearings.

✓ Floating equal size external gears, oversize bearings with gears supported at both ends, packed box or mechanical seal units to suit individual job requirements, efficient operation in either direction, easy accessibility to working parts cuts down "out-of-service" time.

✓ Four-port design offering eight optional piping connections cuts installation time and cost. Four piping arrangements are possible with pump operating clockwise . . . 4 other arrangements with pump operating counter-clockwise.

WIDE RANGE OF SIZES

Capacities ¾ to 300 g.p.m. — pressures up to 1000 p.s.i. — speeds up 1800 r.p.m.

Send for Bulletin of Facts Today

ROPER Rotary Pumps

GEO. D. ROPER CORP., 610 Blackhawk Park Ave., Rockford, Ill.

Bendix's New Hydraulic System

(*Continued from page* 33)

pressure to the righthand port and forcing the piston to its stop C. This piston movement closes the normally-open return valve D and opens the normally-closed inlet valve E, allowing communication between the accumulator and rear brake cylinders. The maximum pressure permitted by this valve may be varied by adjustment of the control piston stop. As the piston travel is lengthened, the spring deflection and load are increased, and consequently the higher will be the brake line pressure before the inlet valve will close. For this installation, the maximum pressure has been adjusted at 450 psi. When the door controller is returned to the door-closed position, the solenoid valve is de-energized, pressure is relieved from the over-rule control piston, and the brakes are automatically released.

The steering gear assembly is shown in Fig. 14. It is concentrically arranged about the axis of the steering column, and in cross-section it is substantially circular. The main gear housing serves as a power cylinder, and the nut, piston and rack form a single sub-assembly. The valve is mounted above and flanged to the housing, and for a single control system, it is normally open. For the multiple control accumulator system it is normally closed inasmuch as it then relies on the same pump that supplies the other power units. The pitman-shaft torque output of this gear is 2900 lb-ft at 1000 psi.

Although the desirable sensitivity and feel or sense of the road are retained with this power steering gear, it will effectively absorb all objectionable impact, or violent reaction so that none is transmitted to the driver's hands. In the heaviest vehicles, there is no wheel fight when striking curbing, broken pavement, mud or abrupt road shoulders. Even with blow-outs of large tires, complete control is maintained. Another obvious advantage of power is the improvement in steering speed that it permits. With present gear ratios, it offers a considerable gain, and it is evident that further improvement may be had by a decrease in ratio. The gear has a ratio of a little over 20 to 1, and it is planned soon to conduct tests with a ratio of approximately 18 to 1.

Other devices of this hydraulic control system include an engine temperature control servo for controlling the position of the radiator shutters, and a hydraulic windshield wiper motor.

BUT . . .

The motor-wise public of this generation demands the best in automotive engineering. Where aluminum — and its alloys — are being processed

Alodizing* With Alodine*

is as drastic an improvement over methods of the past — as today's automobiles are over the horseless carriage. "ALODINE"-coated and sealed aluminum — either painted or unpainted — is effectively protected. "ALODINE" requires no electricity or special skill — no high temperatures. In two minutes, or less, the job is finished. ALODIZED* aluminum is highly corrosion resistant — provides a tenacious bond for paint — saves time and labor — and reduces production costs.

CHEMICALS ACP PROCESSES

RUST PROOFING AND PAINT BONDING
Granodine *
Duridine *
Alodine *
Lithoform *
Thermoil-Granodine *

RUST REMOVING AND PREVENTING
Deoxidine *
Peroline *

PICKLING ACID INHIBITORS
Rodine *

* "ALODINE" ® for Metal Coating Chemicals

AMERICAN CHEMICAL PAINT CO.
AMBLER ACP PENNA.

Cold Extrusion of Steel

(*Continued from page* 41)

increases its length. The forward part of the punch shapes the inner cylinder wall. In succeeding steps, the cylinder is increased to its final length of 25 in. The piece is given an additional phosphate coating before the third and last operations. Pressures required for this operation vary from 15 to 80 tons per sq in., and to withstand these pressures, the die is reinforced by a shrinkage ring. Presses for the work may be mechanical or hydraulic, both having been used by Heintz.

Ordinary types of tool steel are acceptable for this cold extrusion process, Heintz states, and a single punch die may be good for from 3000 to 4000 operations before dressing is called for. So far experiments at Heintz have not progressed far enough to provide data on production costs, however preliminary investigations indicate that the ultimate savings in material will be almost fantastic.

When writing to advertisers please mention AUTOMOTIVE INDUSTRIES

Over the surfaces of these piston rings is the tough, efficient Parco Lubrite coating—tight, nonmetallic phosphate crystals integral with the metal itself. Leading ring manufacturers have for many years used Parco Lubrite.

Parco Lubrite allows faster break-in of close-fitting parts, without the usual danger of scoring and scuffing. Its nonmetallic structure holds lubricant, keeps a film of oil between bearing surfaces.

The smooth, precise, easy seating of Parco Lubrized rings promotes longer life, improved performance, greater owner satisfaction.

Do you have a problem of protection for bearing surfaces? Learn what Parco Lubrite can do for you. Send for free technical bulletin.

THIS IS THE NONMETALLIC, OIL-HOLDING, PROTECTIVE PARCO LUBRITE COATING

Photomicrograph, magnification 100X, shows structure of the effective, positive Parco Lubrite coating. Oil-holding and nonmetallic, it runs-in quickly, smoothly, safely.

PARKER RUST PROOF COMPANY, 2178 East Milwaukee Ave., Detroit 11, Michigan

BONDERIZING Holds Paint to Metal — PARKER PROCESSES — **PARKERIZING** Inhibits Rust — PARKER PROCESSES — **PARCO LUBRIZING** Retards Wear on Friction Surfaces

Bonderite, Parco, Parco Lubrite—Reg. U. S. Pat. Off.

Make the

CRITICAL ACCURACY

you build into your machines

EASY TO MAINTAIN

MOST EQUIPMENT MAKERS who utilize Laminum in accurately fitting gear mesh and bearings do so primarily to reduce precision machining. But the same shim also assures accuracy of future service adjustments... too important to overlook. Bulletin on request.

Laminum shims are cut to your specifications, but for maintenance work, shim materials are sold through industrial distributors.

Laminated Shim Company, Incorporated

51 Union Street • Glenbrook, Conn.

LAMINUM

THE SOLID SHIM THAT peels FOR ADJUSTMENT

New Willys

(*Continued from page* 47)

Returning to the Station Sedan—the Model 663—this will be mounted on the standard 104 in. wheelbase chassis, with the 6-cylinder engine, overdrive, and semi-floating rear axle of 5.38 to 1 ratio with hypoid gear. The front end suspension is the planar construction used on the current Station Wagon with Monroe direct-acting shock absorbers. Monroe shock absorbers also are installed at the rear. Service brakes are four-wheel hydraulic, internal expanding, two-shoe floating anchor, self-centering type—10 in. in diameter x 1¾ in. wide.

The steering gear is Ross cam-and-twin-lever type with a variable ratio of 14-12-14 to 1, mounted on the frame and equipped with a safety type steering wheel.

The new 6-cylinder engine groomed for the Station Sedan and passenger car is of L-head type with four point suspension in rubber and follows the same design practice that has served so well on the 4-cylinder model. Cylinders are cast enbloc and integral with the upper crankcase, heavily ribbed at points of maximum stress to prevent deflection under load. Full length water jackets provide effective cooling. The crankshaft is a carbon steel forging, heat treated. Connecting rods are drop-forged, I-beam section of heat treated steel. The engine has four main bearings of precision type, steel back with a babbitt lining. The same type of bearing is used for the camshaft. Main bearings are doweled in place to prevent rotation and end movement.

Pistons are of light weight cast aluminum with either tin or brass plating. Two 3/32 in. compression rings and one 3/16 in. oil control ring are located above the piston pin. The piston pin is locked in the rod.

Lubrication is a combination of direct pressure to main bearings, connecting rods and timing gears, with pressure stream and splash to other points. The oil pump is of the internal gear type driven by helical gears from the camshaft and with a Floto-type suction pipe.

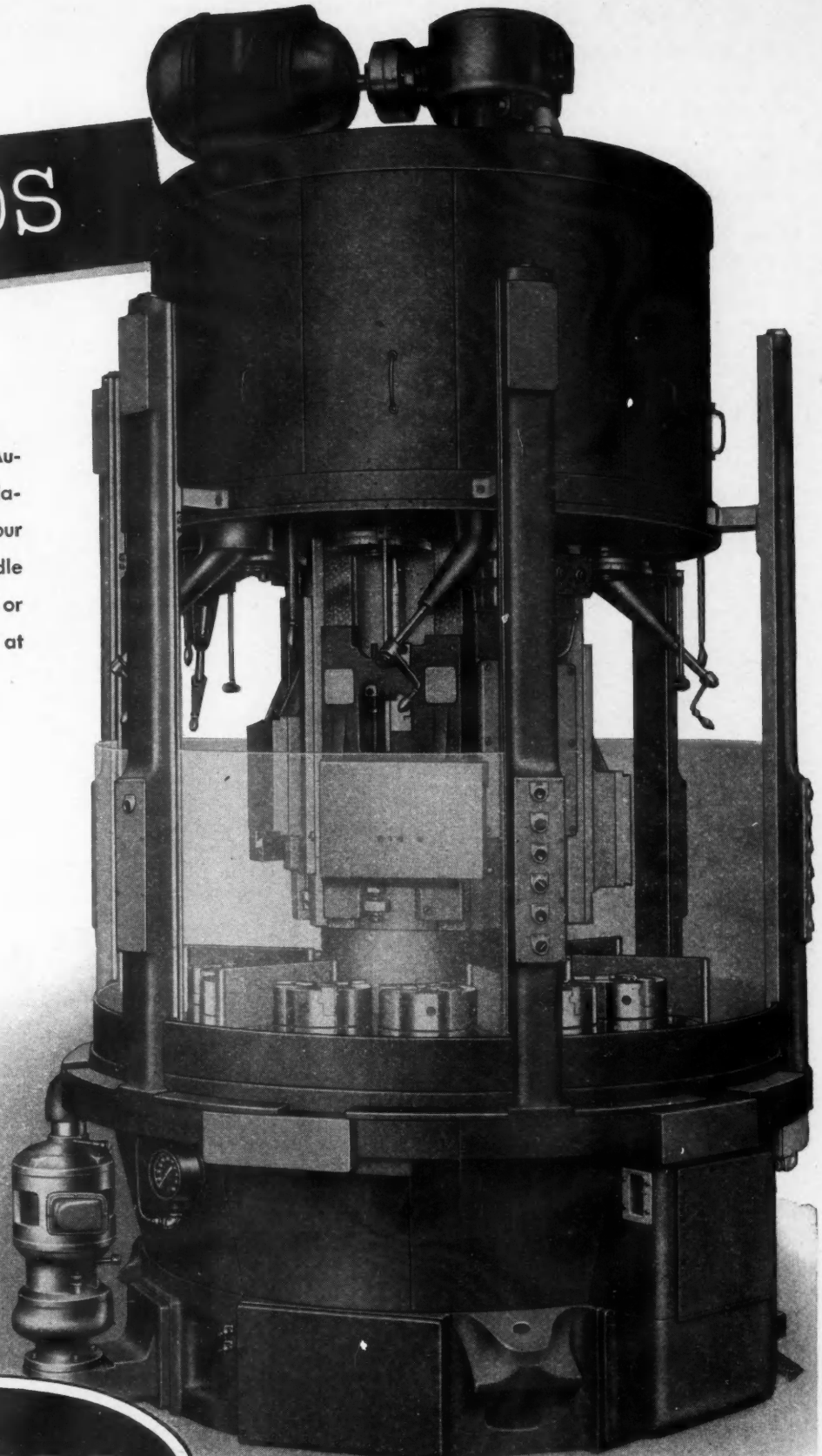
The water pump is of centrifugal type with double row ball bearing mounting, spring loaded composition seal, permanently sealed and packed with lubricant. A thermostat in the water outlet provides for quick warm-up and close regulation of temperature.

The intake manifold is of downdraft, three-port type fitted with either a Carter or Zenith 1¼ in. carburetor of single downdraft type with positive action accelerator pump and single idling adjustment. A dry type air cleaner is standard. The exhaust manifold is a four-port externally mounted unit with thermostatically controlled deflect-

(*Turn to page* 74, *please*)

RECORDS

The BULLARD Type "K" Mult-Au-Matics, for work up to 10" in diameter, are available in four models: 6 or 12 spindles with spindle speeds at 100 to 900 rpm, and 8 or 16 spindles with spindle speeds at 98 to 883 rpm.



BULLARD

TO MAKE MACHINES DO MORE

New Willys

(*Continued from page* 70)

ing valve for preheating intake gases with automatic regulation.

The fuel pump is an AC combination fuel and vacuum booster assembly with a filter bowl.

The Auburn clutch is of dry disc type with a single 8½ in. diameter disc. Clutch facing is woven molded on the pressure plate side and molded on the flywheel side. The pressure plate is supplied by Borg & Beck. The clutch release bearing is of sealed, grease packed ball bearing type.

The valve mechanism includes mushroom type tappets of two-piece steel construction with valves operating in cast iron guides. Single helical valve springs are employed. The entire mechanism is enclosed by a pressed steel cover with a composition cork gasket to assure leak-proofness.

The timing gear train consists of a Celeron or Diamond Fbre composition gear in mesh with a shaved cast iron gear. The engine features positive crankcase ventilation and is fitted with an AC automatic valve.

The electrical system by Auto-Lite, includes a shunt-wound 6-volt, 35-amp. generator with voltage and current regulation from a three-unit regulator mounted on the fender. The generator is driven by fan belt and is mounted on the right hand side of the engine. The starting motor is foot pedal operated and features a manual engaging type over-running clutch pinion. The distributor is of jump spark, automatic vacuum type with spark advance controlled by vacuum from the intake manifold in addition to governor action. The high tension coil has been located on the side of the engine block aft of the distributor to avoid interference with radio reception. 14 mm spark plugs are standard.

The battery is 6-volt, 15-plate, of 100-amp. hr. capacity with wood separators and composition case, mounted under the hood on the dash at the right.

are produced by JOHNSON "Tappet Specialists" . . . men who have made the name JOHNSON a recognized leader in the tappet industry as a manufacturer of all types of precision tappets . . . Adjustable . . . Conventional . . . Hydraulic.

Through superior design and construction JOHNSON Tappets are able to meet the most exacting specifications for automotive, aircraft, marine and diesel engines.

Exhaustive testing has shown JOHNSON Tappets improve engine performance, give better service and last longer.

Write today for new, informative JOHNSON Tappet Bulletins . . . by the makers of tappets exclusively.

Johnson PRODUCTS INC.
MUSKEGON, MICHIGAN
"Tappets Are Our Business"

Steels Classified

(*Continued from page* 38)

distortion produced by upset or header forging requires a steel of superior quality. Gear steels must, therefore, be held to rigid standards of quality and dimension to aid the forge shop in producing a sound and precisely shaped gear blank.

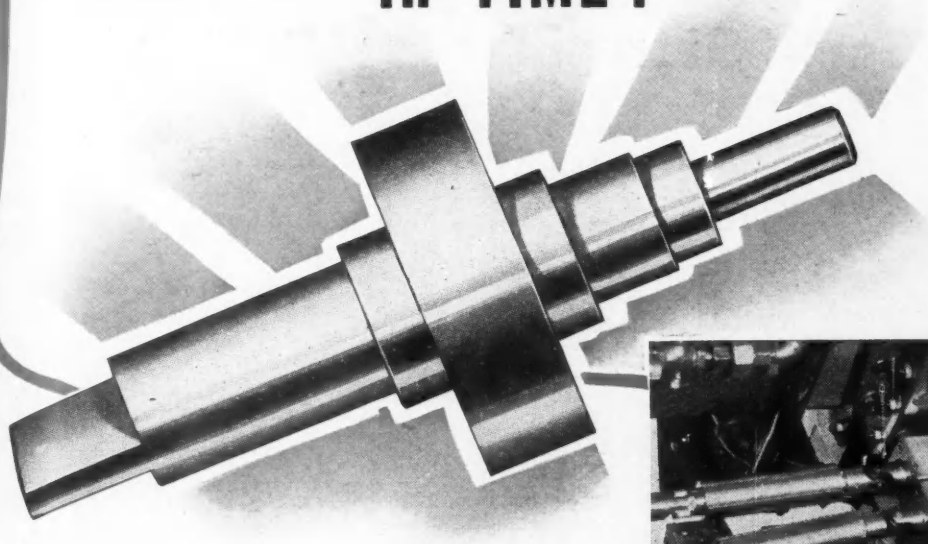
The machining of gears from forged blanks must be easy and cheap, yet the gear must be held to very exact dimensions. Permissible tolerances are so small that ordinary methods of measurement are often useless, and recourse must be had to visual observation of bearing locations by such methods as "green" or "hard" roll, and the "H and V" check. Noisy operation, pitting, and premature failure may be expected when one member of a gear train varies only a few ten-thousandths of an inch from the proper values of involute form, spiral angle, or tooth spacing.

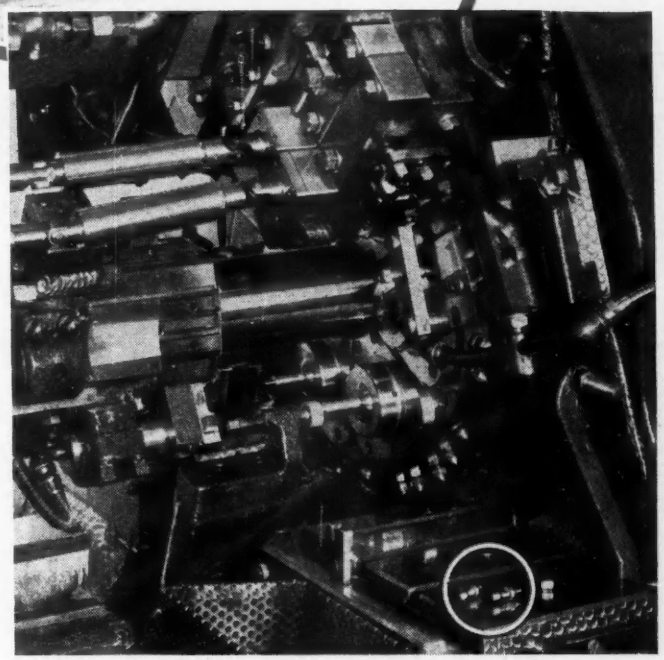
The accompanying table summarizes most of the steel types and treatments used in present-day gear manufacture. Carburizing steels (treatment A) are used where toughness and shock resistance must be combined with high tooth hardness for wear resistance; thorough-hardening steels (treatment C) are used where heavy loads at slow and medium speeds require high strength throughout the gear, with toughness a secondary consideration. The latter steels are often given a cyanide treatment (treatment B) to produce a shallow, hard case for wear resistance.

Recently Carnegie-Illinois Steel Corp. introduced a new series of deep hardening carburizing steels identified as U.S.S. SuperKore steels. These new steels are fundamentally designed to cut both material and manufacturing costs. They can be applied to a wide range of parts sizes, thereby simplifying inventory and specification details and at the same time reducing material and processing costs. Experience indicates that they have improved carbur-

(*Turn to page* 76, *please*)

How about your tolerances in TIME?





In today's production, it is just as important to split seconds as it is to split thousandths, for costs are of increasing importance.

We've learned a good deal in the past few years about how closer work tolerances help achieve both better performance and longer life in all mechanical products.

And now we are finding that producing more precision parts per hour, by using better machines and better production methods, means lower costs—a gain for everybody.

National Acme, with a complete line of improved Acme-Gridley Multi-spindle Automatics, both bar and chucking, is anxious to work with you on basic cost principles on specific jobs you have up right now.

Please feel free to write us.

Here is one example—out of many thousands—of Acme-Gridley cost reduction practice.

The part is a brass pinion blank, one inch long. 8 operations are required, including shaving six diameters for fine concentricity and milling flats on large end.

Entire job done in 4 seconds machine time—900 finished parts per hour.

THE NATIONAL ACME COMPANY

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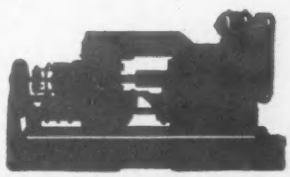

ACME-GRIDLEY BAR and CHUCKING AUTOMATICS
Maintain accuracy at the highest spindle speeds and fastest feeds modern cutting tools can withstand.

SPRINGS

Wire Forms • Small Stampings

Large and varied stocks of materials

Completely engineered production with laboratory control from start to finish.

Speedy automatics for large orders . . . Special department for small orders

Latest methods for uniform heat-treating

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Steels Classified

(*Continued from page* 74)

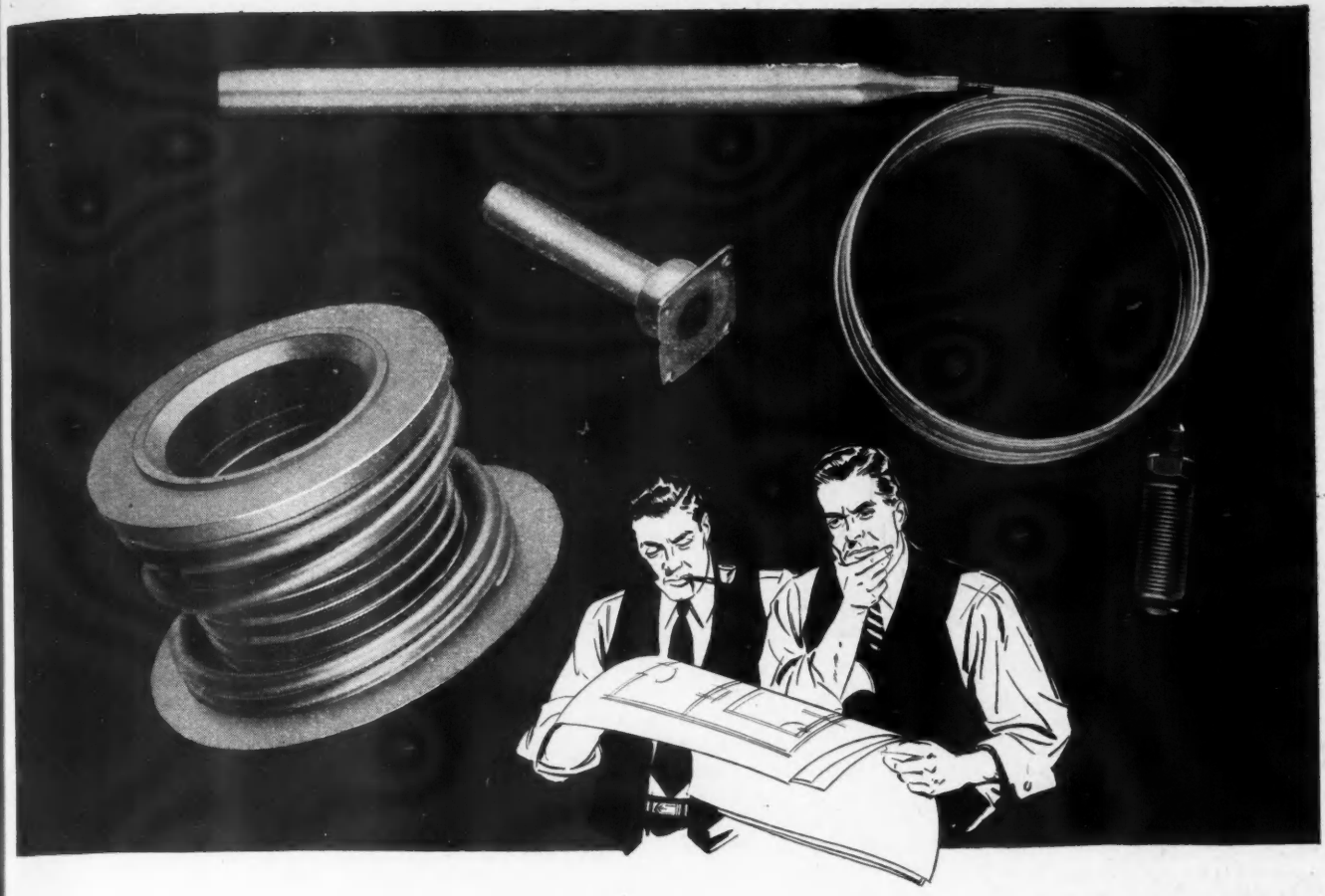
izing, annealing, and machining characteristics in applications where heavy duty service formerly required the use of more highly alloyed carburizing steels, such as the 3300, 4300, 4800, and 9300 types. At the same time, these U.S.S. SuperKore steels retain the essential physical properties necessary for the applications for which they are intended. Selection of grades should be based upon metallurgical considerations of microstructur, heat treatment, core strength, size and practical experience.

To obtain the most desirable microstructures for machining, carburizing steels are generally normalized and tempered or isothermally annealed at a temperature just under their lower critical. The use of long, slow cycles in heating or cooling should be avoided, as ferrite agglomeration so produced results in "gummy" machining. The higher-carbon, thorough-hardening grades are usually annealed by continuous cooling or isothermal methods to produce a coarse, well-distributed pearlite, with a degree of spheroidization chiefly dependent upon the tool set-up of a particular manufacturer.

CALENDAR

Conventions and Meetings

Paris Automobile Show and SIA Meeting .....Oct. 23-Nov. 5
Amer. Soc. Tool Engineers—Semi-Annual Mtg., Boston .....Oct. 30-Nov. 1
Natl. Tool & Die Mfg. Assoc.—Annual Mtg., Phila. .....Nov. 2-5
Natl. Electrical Mfrs. Assoc., International Lighting Exposition & Conference, Chicago .....Nov. 3-7
Natl. Airport Show & Institute, Cleveland .....Nov. 4-7
Amer. Soc. of Body Engineers, Annual Tech. Convention, Detroit Nov. 5-7
Society of Automotive Engineers, Fuels, & Lubricants Mtg., Tulsa .....Nov. 6-7
Trailer Coach Mfgs. Assoc. Show, Philadelphia .....Nov. 8-15
Automobile Old Timers' Reunion, New York City .....Nov. 12
Assoc. of Amer. Battery Mfgs., Annual Mtg., Chicago .....Nov. 13-15
Society of Automotive Engineers-Air Transport Mtg., Kansas City..Dec. 1-3
Amer. Soc. of Mechanical Engineers, Annual Mtg., Atlantic City....Dec. 1-5
International Aviation Mtg., El Paso, Texas .....Dec. 4-7
Automotive Service Industries Show, Chicago .....Dec. 8-13
Natl. Motor Boat Show, New York City Jan. 9-17
Soc. of Automotive Engineers Annual Mtg., Detroit .....Jan. 12-16
Natl. Materials Handling Exposition, Cleveland .....Jan. 12-16
Natl. Auto Dealers Assoc. Exhibition, Chicago .....Jan. 25-29
Chicago Production Show, Chicago Mar. 22-24



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More and more designers are taking advantage of the great versatility of bellows assemblies, specifying them in increasingly wide fields of application. Here are some of the functions bellows assemblies are designed to perform efficiently and economically:

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- Seal rotary shafts against leakage of liquid or gas.
- Transmit movement hydraulically to remote points.
- Provide a flexible joint for instruments combining rotary motion and hermetic seal.
- Compensate for changes in temperature or pressure.
- Seal valves against leakage (packless valves).

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CLIFFORD HYDRON Metal Bellows

HYDRAULICALLY-FORMED BELLOWS

ALL-ALUMINUM OIL COOLERS

Nash Pioneered in Automatic Transfer Lines

By Joseph Geschelin

THE impact of current developments as well as the interruption of normal passenger car production during the war years combined to obscure the credit due for some of the major pioneering work in the application of automatic transfer machines. This brief comment by your editors is intended to set the record straight.

It has been drawn to our attention that although the Greenlee transfer machine developed during the war for the machining of Wright cylinder heads was perhaps the first installation in the aircraft industry, it was not the earliest example of the technique.

According to the record, the first large scale installation of the modern transfer line—as it is known today—was made by the Nash-Kelvinator Corp., in preparation for building engines for the Nash 600 when it was introduced for the 1941 season. This engine line, which was in operation in 1940, featured a unified and automatic machine line for the cylinder block, boasted the first examples in the passenger car industry of the Greenlee automatic transfer units of multiple-station type and Natco and Ingersoll transfer units. Reference to this line was made in an article by Joseph Geschelin in Automotive Industries, February 1, 1941. On pg. 104 of this article is reproduced a view of one of the nine-station Greenlee transfer machines, drawing attention to the complete automaticity of the unit as well as the roll-over fixture serving it, and commenting on the tell-tale signal light panel which is a feature of many of the transfer machines currently being installed.

It is of interest to add that 1940 also saw the first introduction of transfer machines in the tractor industry with the announcement of the start of production of the then new Milwaukee Works of International Harvester Co. This remarkably modern line designed for the production of diesel engines for tractors and industrial machinery was described rather fully in AUTOMOTIVE INDUSTRIES, December 1, 1940.

In the face of this evidence it is clear that the transfer machine as we recognize it today stems directly from major applications made at least as far back as 1940. And, of course, the conception of the principle goes back even earlier to the design stages and experimental production prior to manufacture of commercial units.

British

(*Continued from page 34*)

the next three years. Present orders from essential users total 500,000 and total orders booked for the home market are more than 900,000.

If the Government suggestions are carried out, several small manufacturers of costly cars will be forced out of business because raw material will not be issued to them. The Government viewpoint is that unless these makers can contribute effectively to the export drive they should be sacrificed. The Manufacturers Society claims that these cars earn foreign currency and uphold British prestige abroad.

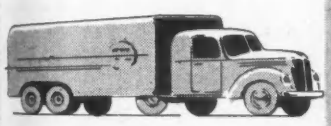
Austin has revealed a new four-cylinder overhead-valve model of 40 hp, which will replace three older models. This car already has been shown in the United States (see Oct. 1 AUTOMOTIVE INDUSTRIES, page 20). Known as the A-40, there are two versions, the Dorset two-door and the Devon four-door. Outstanding changes are the adoption of overhead valves and the use of coil-spring independent front-wheel suspension. The car has a wheelbase of 92½ in. and a tread of 45 in. A Borg and Berg plate clutch is used together with a four-speed transmission. Equipment includes a

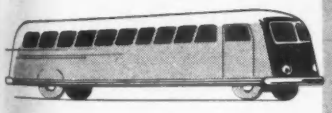
(*Turn to page 82, please*)

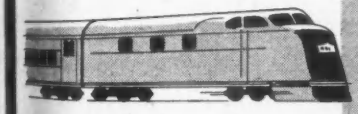
HIGH *in utility*

LOW *in cost*

a MATERIAL aid to modern design







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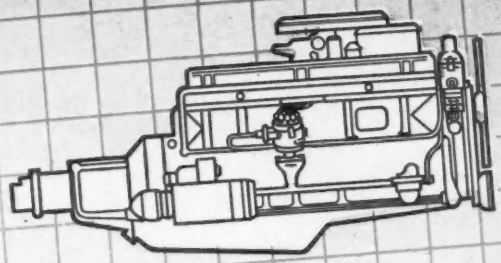
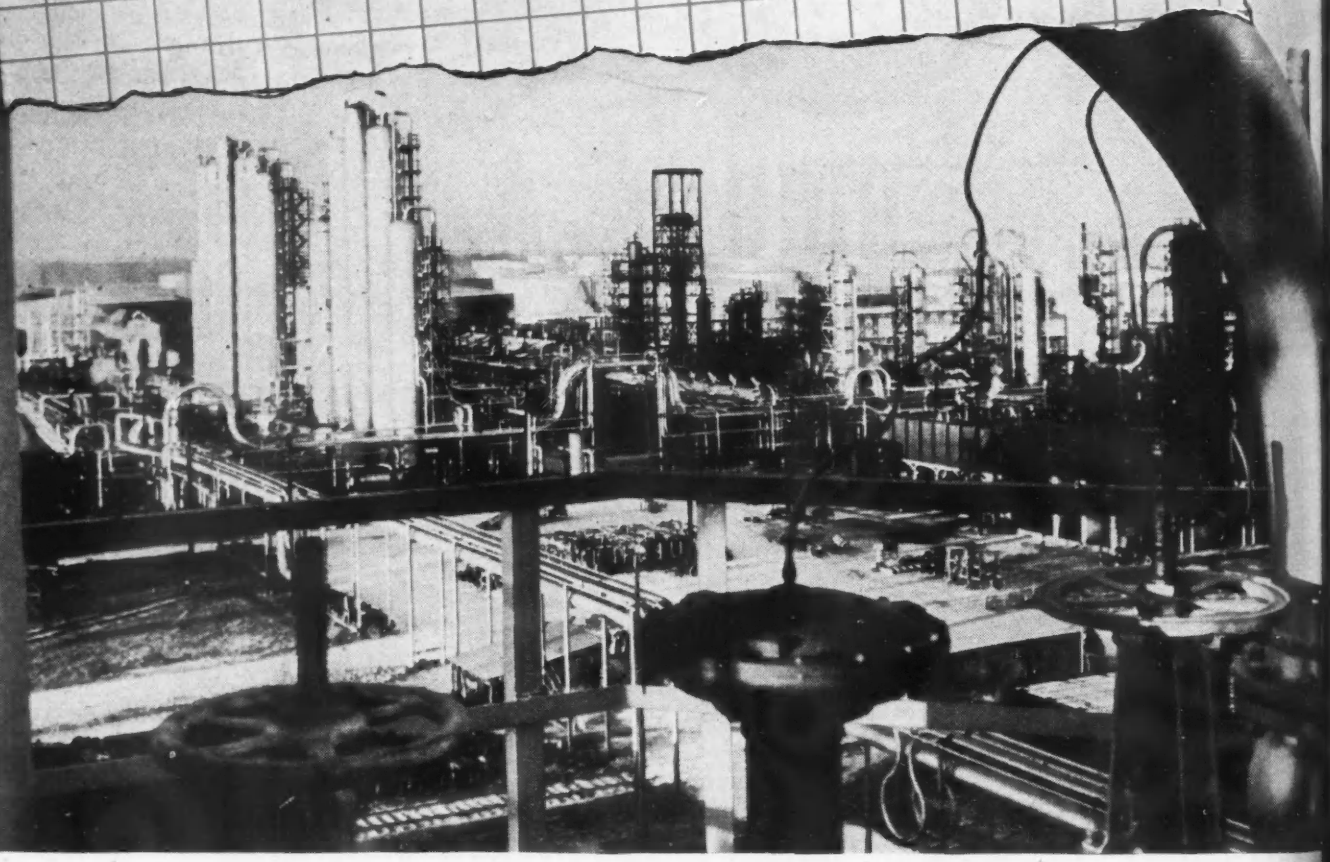
PLANNING 1950's Engines in Terms of 1950's Gasolines





If the full potentials of the gasoline expected to be generally available in 1950 are realized, gasoline mileage will be increased twenty per cent. This increase would permit 5,000,000 additional passenger cars to travel a total of 40,000,000 miles annually.

Gasoline characteristics are not static—but change constantly as advances are made in refining technology and as the petroleum industry acquires new equipment or revises existing equipment. In particular, the antiknock quality of motor fuels has reflected improvements in refining methods and the use of antiknock mixtures. For the past twenty years, despite temporary setbacks caused by wartime and reconversion conditions, the trend has been toward higher octane numbers—with every indication that this trend will continue.

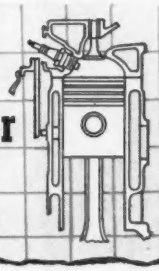
In 1941 regular grade gasoline reached an average octane rating of 75 (Motor Method)—an increase of 15 octane numbers over 1930. Average premium gasoline advanced from 70 to 80 during the same period.

It is estimated that by the beginning of 1950, regular and premium grades of gasoline will have reached average Motor Method octane ratings in the neighborhood of 80 and 86 respectively, while Research Method ratings will have risen to 86 and 93. These estimates* are conservative ones based upon the extension of the trend shown in the past and do not take into consideration the accelerated

improvements in refining methods and equipment brought about by the war.

Engine designers are searching for practicable means to utilize the higher antiknock quality of these future fuels. Higher compression ratios and supercharging offer two possible approaches to the problem.

What are the possibilities of higher compression ratios?



Higher compression ratios offer substantial increases in both economy and performance.

For example, an increase in the compression ratio of an engine from 6.1 to 8.5, together with a change in axle ratio that kept low-speed acceleration at its original level, yielded an improvement of 21% in average level-road fuel economy. Accompanying this increase was a substantial increase in high-speed acceleration, and an increase of 7 miles per hour in the maximum speed of the vehicle. This engine with 8.5 compression ratio had an octane requirement of 90 Motor Method when operated on reference fuel, and it was satisfactory on sensitive fuels having much lower Motor Method ratings.

However, as engine output per cubic inch is stepped up, through elevation of compression ratios, formidable problems are encountered, involving factors such as torsional and overall rigidity, combustion chamber design, autoignition, and the design of ignition systems.

What are the possibilities of supercharging?

Fuels of a wide range of octane numbers have been used in the Ethyl Laboratories in experimentally super-charged engines for passenger and commercial vehicles. Because supercharging results in greater power output per cubic inch of displacement, it permits the use of a smaller engine for a given application. If the supercharger is arranged so that it functions only after the demand for power exceeds the power of the smaller engine operating with natural aspiration, very attractive improvements in fuel economy may be achieved as well. Thus supercharging offers another means of utilizing the improved fuels.

Here too, the research engineer is challenged by complex problems, such as those of engine rigidity, autoignition, higher gas temperatures and blower design.

* * *

It is evident that the planning of tomorrow's engines is a job which cannot be separated from the planning of tomorrow's fuels and lubricants, and which therefore demands the combined skill and knowledge of technologists of the automotive, petroleum, and allied fields. The research and service organization of the Ethyl Corporation has been cooperating with the oil and automotive industries in work on the coordinated development of engines, fuels and lubricants for more than twenty years. With this background of experience, coupled with modern facilities designed especially for such work, Ethyl's Research Laboratories are continuing their part in the never-ending effort to advance automotive transportation each year to new levels of performance, economy, comfort, safety and reliability.

**The prediction and figures given are from a paper delivered before the SAE by Earl Bartholomew, General Manager, Research Laboratories, Ethyl Corporation. This paper, in booklet form, will be mailed to you upon request.*

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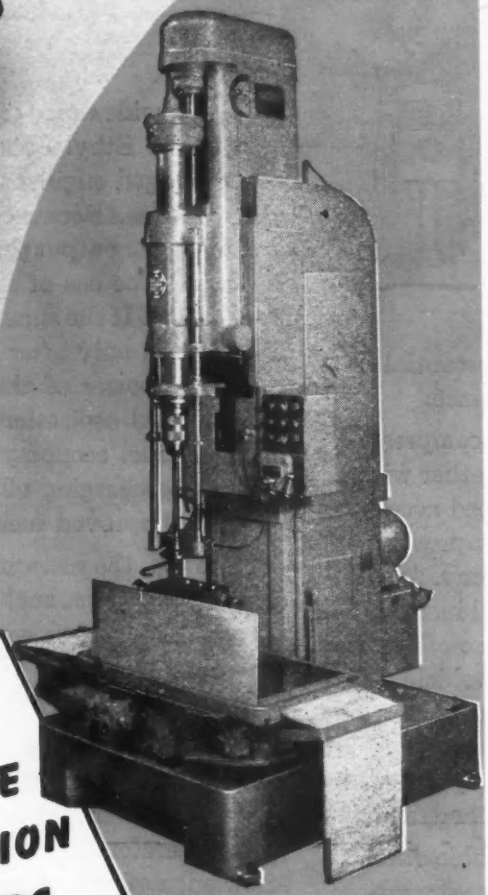

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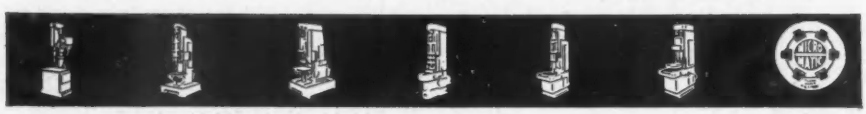

British

(*Continued from page* 78)

jack operated by a wheel brace from inside the car to lift either its right or left side.

Lea Francis announces a new sports roadster model with a four-cylinder engine developing 64 hp at 5300 rpm, compression ratio being 7.25 to 1. A 90-hp model is about to go into production.

Humber has adopted the synchromatic transmission for its 1948 five-passenger 56-hp Hawk. Changes in the engine are full length water jackets, an oil bath for the valve tappets, a bigger air filter and silencer and a new type of filter for the pressure lubricating system.

The Designer and Manufacturing Costs

(*Continued from page* 46)

nomical design which expands the total area will result in higher sales cost or lower margin of profit or both. A design which reduces the area will result in higher margin of profit or reduced sales price or both.

The cost of the minimum amount of material required to build an airplane can be said to be outside the control of the design engineer. However, whenever drawings call for material in excess of this minimum, for instance closer tolerances or special sizes, or to meet higher than necessary mechanical properties or chemical analysis requirements, then the cost exceeds the minimum and the excess is within the control of the design engineer. For example, a choice between extrusions at $0.07 and bar at $0.10 makes it possible to release a design costing 1.4 times more expensive than necessary.

Percentage of control exercised by the design engineer over equipment is somewhat smaller than for material. However, the most expensive equipment is not necessarily the best, nor should equipment which will perform more functions or perform them more efficiently than necessary be chosen unless the cost and service record of the equip-

(*Turn to page* 84, *please*)

Fig. 12
Cost breakdown of transport airplane

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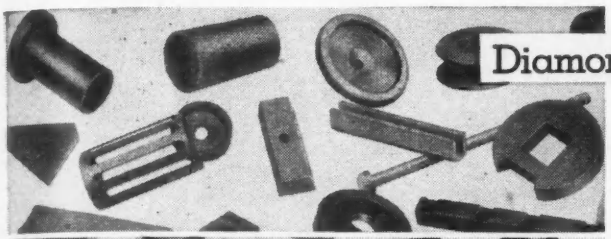

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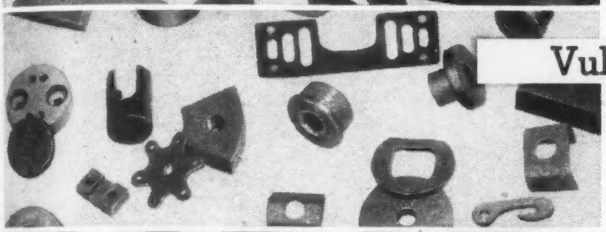

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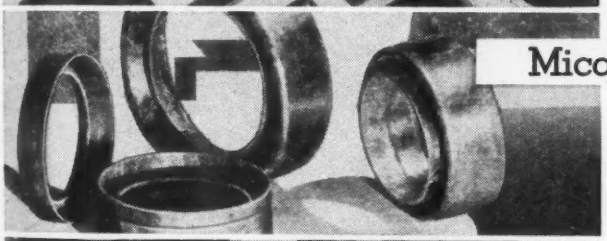

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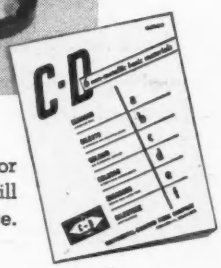

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The Designer

(*Continued from page* 82)

ment are in keeping with the quality, functional and price standard set for the airplanes. The examples shown in Fig. 13 indicate how the designer may "miss" on equipment items.

Direct labor consists of the manpower dollars spent in the actual manufacture of the design by the sheetmetal worker, the welder, lathe operator, riveter and other skilled workmen. The designer may reduce direct labor at the expense of material or tooling or may increase direct labor by designs which do not permit the use of economical tooling or factory methods.

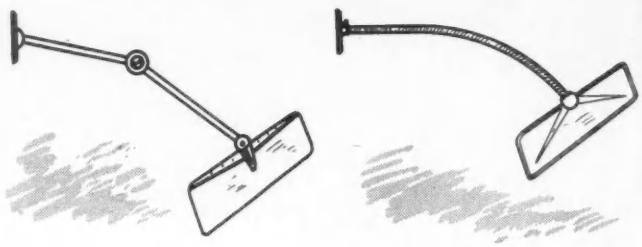

Fig. 13
Effect of design on cost of equipment for the transport plane. The sunshade at the left, made in accordance with designer's specifications, cost $12.80. Purchased as a standard item used in a low-cost automobile, as shown at the right, this part cost only $1.20

Indirect labor consists of two parts: direct labor overhead such as supervision, maintenance personnel service; and manufacturing overhead such as procurement, planning, scheduling, dispatching, order control, stocking. The first division arises from the existence of the labor force, and is affected by design in the same manner as direct labor is affected. The second division arises from the existence of parts and details, and the design effect on this part is roughly proportionate to the number of parts required to build the airplane.

As much as 30 per cent of the tooling cost of a typical transport airplane, as affected by design, is within the control of the designer. Care in selecting structural breakdown, type of joints and design of details are requirements for good tooling, and are all directly tied in with the design of the parts and assemblies. Uneconomical breakdown and joint or structural design may cost thousands of needless tooling dollars. Uneconomical design of one detail part or small assembly may not run into thousands of dollars, but uneconomical design of thousands of details and small assemblies will run into thousands of needless tooling dollars.

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Electronic Analog Studies for Turbo-Prop Control Systems

By G. A. Philbrick
G. A. Philbrick Researches, Inc.
W. T. Stark and W. C. Schaffer
Wright Aeronautical Corp.

THE Wright Aeronautical Corp.'s electronic Analog is a calculating device which is used to investigate the design of turbo-prop control systems. It was designed and fabricated by G. A. Philbrick Researches, Inc. When set from calculated or empirical data, the Analog presents an oscilloscopic time plot showing the behavior of the important variables during and after applied transient disturbances.

The five prime variables involved in the performance of turbo-prop control systems are speed, torque, temperature, fuel flow, and propeller blade angle. These variables are so interrelated during control that each affects the others. In addition, the problem is further complicated by the inertia and torque characteristics of the turbo-prop engine.

The Analog computer is composed entirely of electronic components which

(*Turn to page* 86, *please*)

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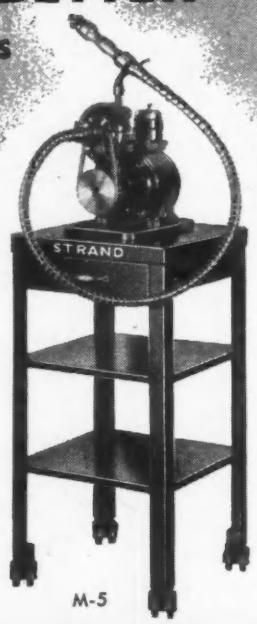


Strand machines provide PORTABLE rotary power at CONSTANT speeds with dependable results and less operator fatigue. Ruggedly built for years of steady use. Hundreds of attachments easily interchanged—125 types and sizes—vertical and horizontal models from ⅛ to 3 H.P.

VISIT BOOTH 2323 ASM SHOW CHICAGO OCT. 18-24

DISTRIBUTORS IN ALL PRINCIPAL CITIES

Send for CATALOG showing complete line

M-5

Strand FLEXIBLE SHAFTS

N. A. STRAND & CO.
5002 NO. WOLCOTT AVE.
CHICAGO 40, ILL.

Electronic Analog Studies

(*Continued from page* 84)

are widely adjustable to simulate any particular design of turbo-prop engine and control system. Basically, the computing portions of the instrument are arranged in two channels as shown in Fig. 14, one corresponding to the turbo-prop engine and the other to the control system. The two channels are reciprocally inter-connected to affect one another in exact simulation of the inter-effects of control and engine. Each electronic component is provided with calibrated adjustments corresponding to the individual physical constants of the system under study. Means are also incorporated for checking the dynamic relationships which are established by these adjustments, and means are provided for periodic disturbances to either inputs or outputs of the system.

A symbolic representation of the basic parts of the Analog is given in Fig. 15. The inputs to the engine are the outputs of the control system, propeller blade angle and fuel flow. Likewise, the outputs of the engine are the inputs of the control system, turbine speed, torque, and temperature. Each of these variables is represented by a measurable voltage to a fixed scale ratio, and the transient behavior of each may be displayed at will on the oscilloscope screens. The characteristics of the turbo-prop engine are set by means of nine adjustable parameters consisting of six static partial derivatives and three dynamic properties. The latitude of adjustment thus provided is illustrated by the fact that the performance of reciprocating engines has been simulated by the Analog channel intended for turbo-prop engines. Naturally, such latitude allows many valuable studies of the effect of physical variations on performance under control.

In the control channel, 16 adjustable parameters determine the dynamic character of the possible individual regulatory components. Means are also provided for study of various propeller and fuel control mechanisms. The contribution of any individual component to the overall performance may be determined immediately by manual switching operations.

The repetitive disturbance, necessary to initiate recovery transients, is a square wave or step function which may be imposed at will at any of five separate positions in the system. The disturbances correspond, for example, to sudden shifts by an operator in the control settings of speed, temperature and torque. In addition, the disturbance may be imposed as change in fuel flow or propeller pitch over and above the manipulation from the control system. Thus the performance and stability of a given system may be evaluated readily for all types of disturb-

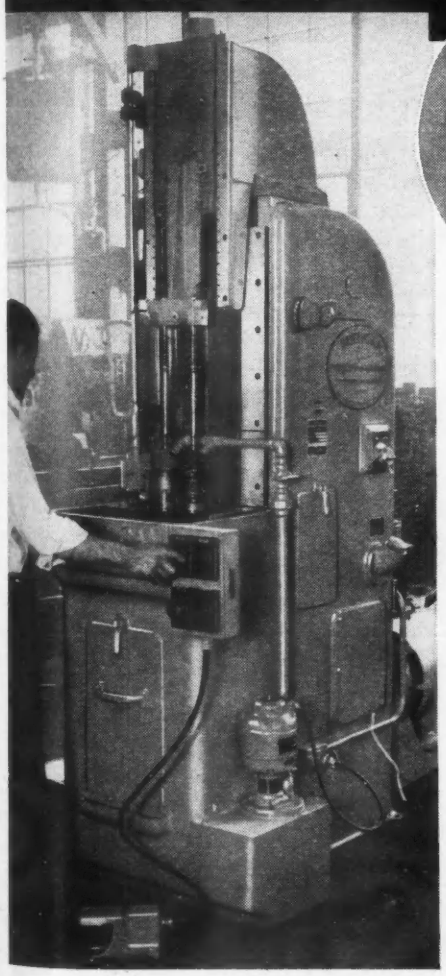
(*Turn to page* 90, *please*)

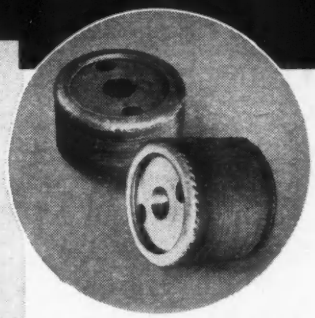
AN ALL-PURPOSE BROACHING MACHINE

That's What You Get with *American's* 3-Way

A machine that gives you pull down, push down, and surface broaching; a machine that can be used for a wide variety of internal and surface broaching jobs—that's *American's* exclusive 3-Way Vertical Hydraulic Broaching Machine. You can change over from one type of broaching operation to another quickly. It requires only replacement of fixture and broaches, and addition of pull head and lugs.

For all types of broaching machines, for all kinds and sizes of broaches, for tooling and fixture design based on more than a quarter century of broaching experience—look to *American*, the one source for all your broaching needs. For the best in broaching—machines, tools, and engineering—see *American* first!





For broaching the holes in laminated commutator parts an *American* T-8-24 3-Way machine equipped with special broach retriever unit, foot switch, and electric controls was provided.

With the above extra equipment the operation is semi-automatic. Operator loads two parts and starts retriever unit, which lowers broach pilots through work into automatic quick connecting pull heads. Machine slide pulls broaches through work, operator unloads and starts return of machine slide by foot switch. At end of return stroke he loads two more pieces and begins cycle again.

★ ★ ★

A new circular tells the complete story of *American's* Type-T 3-Way broaching machine. A letter or post card will bring it to you by return mail. Write today for Circular 100.

To illustrate the wide variety of broaching jobs possible on this all-purpose machine, the Standard T-8-24 is pictured above.

This machine is operated by manual controls and the broach holders are mounted directly on the main machine slide. The operation is surface broaching the teeth in a round bar with the tooling designed to automatically clamp and eject the broached parts.

American
BROACH AND MACHINE CO.

ANN ARBOR, MICHIGAN

•

BROACHING MACHINES
PRESSES
BROACHING TOOLS
SPECIAL MACHINERY

DIVISION OF SUNDSTRAND MACHINE TOOL CO. ROCKFORD, ILLINOIS, U.S.A.

FELT SEALS RETAIN LUBRICANTS, EXCLUDE DUST

Two Basic Types of Felt Seals, Applicable in a Wide Variety of Designs, Solve Most Sealing and Packing Problems

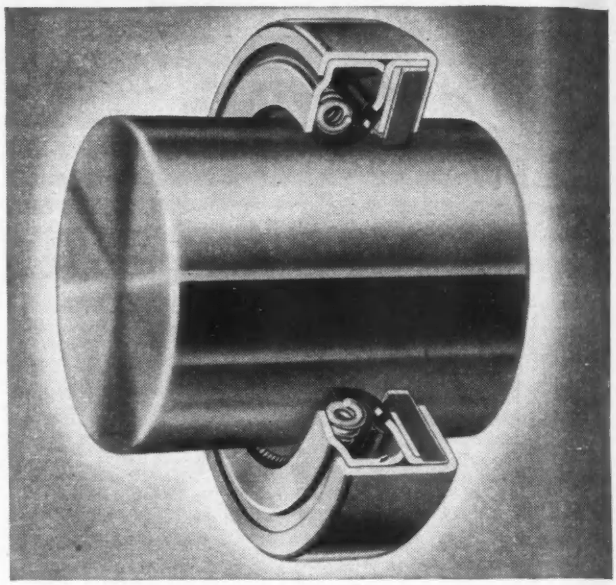
The unusual and unique properties of felt make it especially valuable in sealing and packing applications. Such uses are increasing steadily, as more and more engineers and designers appreciate the simplicity of application, reliability of performance, and long life of felt. For any machines in which it is necessary to retain bearing lubricants, and feed them automatically and uniformly as needed, or from which dust, fumes, or moisture must be excluded, felt seals and packings merit your consideration.

PHYSICAL CHARACTERISTICS

The chief physical characteristics of felt that make it so highly suitable for seals are absorption capacity, low coefficient of friction, and resiliency. Oil absorption capacity is high, and is largely a function of felt density. Table 1 gives the absorption values of American Felt Company's standard S.A.E. felts for a range of commercial grade lubricating oils. However, any type of felt suitable for sealing purposes generally holds enough oil to give reliable performance without attention between major overhauls. The coefficient of friction averages 0.22 for dry felt against steel, which is reduced to 0.15 when the felt is pre-saturated with oil of 41.2 Saybolt viscosity at 210°F. Because of its resilience, felt maintains a constant sealing pressure regardless of wear, end-play, minor misalignment or out-of-round conditions of metal shafts and assemblies. Another important advantage of felt is that if it should run dry as a result of operation past the time for overhaul, it tends to polish rather than score a shaft. Under normal bearing temperatures and speeds, felt will never fail through aging, embrittlement, or disintegration.

TWO TYPES OF SEALS

Plain Felt Seals. These are precision-cut washers, produced by American Felt Company, with a tolerance of .005". They are cut from standard types of S.A.E. Felt, and may be pre-



saturated with lubricant before assembly. The lubricant employed is generally one higher in viscosity than that which is to be retained. Such seals have only two limitations: they should not be used to retain oil of extremely low viscosity, nor to retain pressurized lubricants. For such services, the laminated seal is recommended.

Laminated Felt Seals. In these, the plain felt seal is combined with one or more impervious septums of 1/64 to 1/32 inch sheet Hycar. The felt may be of the same density throughout, or felt of different densities may be used on opposite sides of a septum. Thus a laminated seal can have felt of high density and oil retention capacity on one side, and on the other side a lower density felt for dust exclusion. An example of this is seen at (a) in the drawing, which shows a single-unit washer that combines lubricant-retention, sealing, and dust-exclusion.

TABLE 1—OIL ABSORPTION CAPACITY OF SAE FELTS AT 76 F.[2]

SAE No.	Felt Density Per cent Specific Gravity	SAYBOLT VISCOSITY[1]						
		35.0	39.6	41.2	46.1	50.7	61.3	77.0
F-1	35.80	165%	157%	170%	161%	173%	179%	155%
F-3	31.00	203%	183%	207%	212%	200%	201%	205%
F-5	25.90	238%	225%	244%	240%	241%	244%	252%
F-7	26.70	232%	206%	221%	252%	241%	233%	227%
F-10	18.70	427%	450%	464%	456%	476%	470%	476%
F-11	19.45	387%	382%	352%	341%	367%	461%	354%
F-13	17.40	356%	359%	378%	378%	394%	384%	392%
F-15	18.45	334%	331%	334%	349%	353%	348%	363%

[1] Saybolt Viscosities at 210 F.
[2] Per Cent Weight Increase at Saturation Point as determined by Volume Displacement Method at 76 F.

The impervious septum may also be on only one side of the washer, as in (b). The multiple laminations of (c) to (e) inclusive are further modifications, developed for progressively more difficult mechanical sealing operations. In each case, the impervious layer of oil-resistant Hycar functions as a positive dam against low viscosity lubricants. These seals will also withstand a moderate amount of lubricant pressure.

IMPREGNANTS

Both plain and laminated felt seals may be impregnated with standard grades of oils and greases, or special treatments may be used to meet unusual conditions. For minimum friction, micronized graphite is employed. For pressurized service, or to exclude water or mud, impregnations of paraffin, petrolatum, or graphite are sometimes used, as in marine stuffing boxes and plunger valves, and in other critical sealing applications. The versatility of felt for sealing purposes is one of its important advantages.

DESIGN CONSIDERATIONS

Both plain and laminated felt seals have a rectangular cross section. The inside diameter of the washer is from 0.005" to 0.030" less than the outside diameter of the shaft over which it is to fit, depending upon the type and density of the felt specified. Thickness of the washer also depends upon the type of felt, and increases with shaft diameter. Some typical designs are shown in Fig. 2.

Turned or cored housings are preferably designed with tapering sides in the form of an isosceles trapezoid with the sides inclined from 4° to 7°. This taper serves to compress the washer radially inward, effecting a constant pressure on the shaft. In the case of exterior glands or packing plates where the design requires that one wall be at right angles to the shaft, the inner wall of the housing should be inclined.

SELECTION

Felt seals, plain or laminated, are recommended where operating temperatures lie between −60° and 250°F. and where peripheral shaft speeds do not exceed 2000 feet per minute. Since felt is an engineering material, thoroughly understood and standardized, selection of the proper type to meet any given conditions within the above range can be made with complete confidence. In general, S.A.E. F-1, F-2 and F-3 felts are used for difficult oil or grease retaining conditions, with shaft speeds over 1000 feet per minute. S.A.E. F-5, F-6 and F-7 felts are employed for lubricant-retaining washers at shaft speeds between 750 and 1000 feet, and also for difficult excluding conditions at speeds over 1000 feet. S.A.E. F-10, F-11, F-13 and F-15 felts are suitable for lubricant retention at shaft speeds less than 750 feet per minute, and as dust-excluding washers, for shaft speeds less than 1000 feet per minute. S.A.E. F-50 felt is employed in precision ball bearing seals.

FORMS

American Felt Company supplies felt for seals either in roll or sheet form, or cut into washers to your specifications. This felt is in abundant supply, uniform in quality as to each type, deliveries are prompt, and in most cases the felt washers are the lowest-cost parts of a given machine or assembly.

COLLABORATION

American Felt Company engineers will gladly collaborate with you in such matters as design of seals and selection of the proper type of felt. The material in this advertisement is a condensation of data given in American Felt Company Data Sheet No. 11, "Felt Seals, Their Design and Application." This contains additional technical information, such as tables showing oil absorption capacity and dimensional tolerances and degree of housing compression for plain and laminated felt seals. This eight-page Data Sheet is the outstanding paper on this subject. A copy will be sent you if you will write your request on your letterhead.

APPLICATIONS
(plain and laminated felt seals)

SAE Felt Grades	Shaft Diameter	Application
F-1 F-2 F-3	0.5" 1.0" 1.5" to 4.0"	Difficult oil or grease retaining conditions and shaft speeds exceeding 1000 feet per minute.
F-5 F-6 F-7	0.5" 1.0" 1.5" to 4.0"	Oil or grease retaining washers for shaft speeds between 750 and 1000 feet per minute. Also, difficult dust-excluding conditions where shaft speeds exceed 1000 feet per minute.
F-10 F-11 F-13 F-15	0.5" 1.0" 1.5" 2.0" to 4.0"	Oil or grease retaining washers for shaft speeds less than 750 feet per minute. Also, dust-excluding washers for shaft speeds less than 1000 feet per minute.
F-50	....	Precision ball bearing seals.

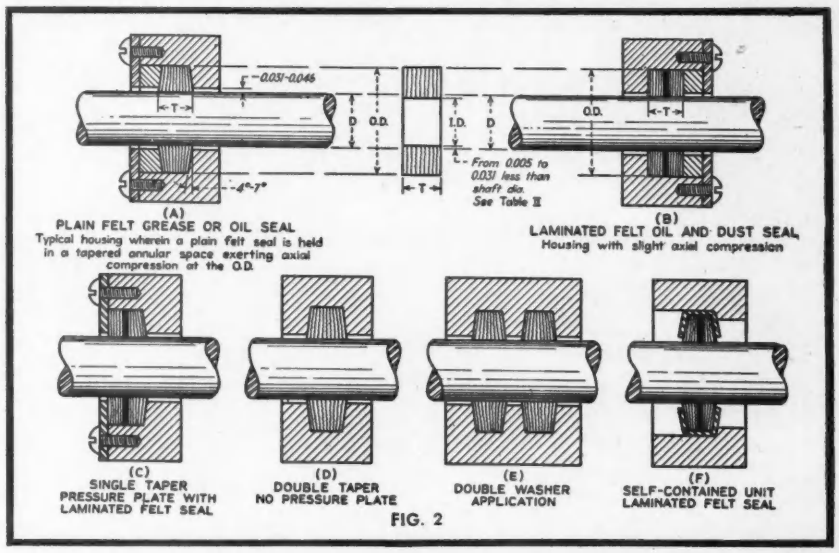
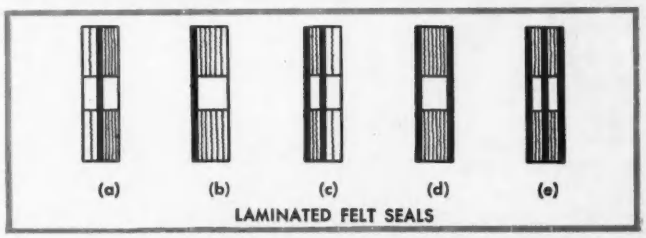


FIG. 2



LAMINATED FELT SEALS

American Felt Company
TRADE MARK

Engineering and Research Laboratories: Glenville, Conn.
PLANTS: Glenville, Conn.; Franklin, Mass.; Newburgh, N. Y.; Detroit, Mich.
SALES OFFICES: New York, Boston, Chicago, Detroit, Cleveland, St. Louis, Philadelphia, Atlanta, Rochester, Dallas, San Francisco, Los Angeles, Portland, Seattle, Montreal

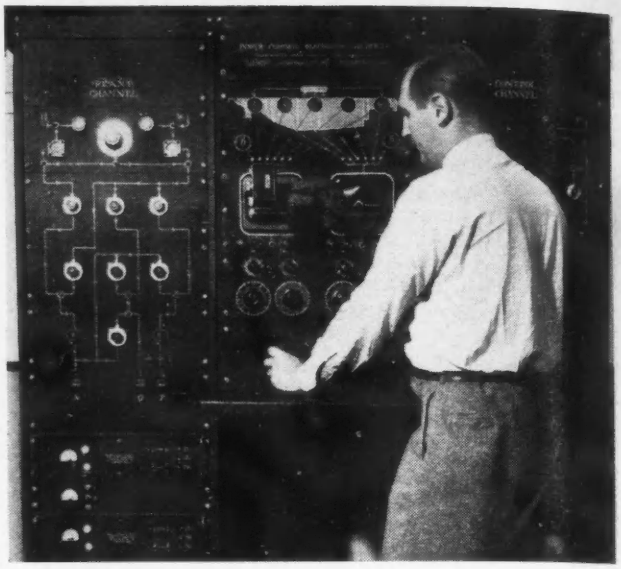


Fig. 14—Wright Aeronautical Corp.'s Analog. This electronic "brain" is used for solving equations involved in the design and testing of control systems of aircraft gas-turbine engines

(*Continued from page* 86)

ances. Two oscilloscopes are provided so that the transient recovery of any pair of the system's variables may be observed simultaneously. A unique feature employed is that any variable may be plotted against any other, thus eliminating the dimension of time except as a parameter along the trace. The resulting figures, similar to the so-called Lissajou diagrams, are of interest in providing a dramatic visualization of the phase relationships existing throughout the system during transients.

From the foregoing discussion, it is apparent that stability and performance of proposed control systems can be investigated in detail. Not so apparent, however, is the facility for determining, by a few twists of a dial, how critical any parameter of the entire system may be. Thus, tolerances in the dynamic constants of the regulatory devices may be assigned with considerable assurance. This is important in the engineering of controls for maximum reliability and minimum size.

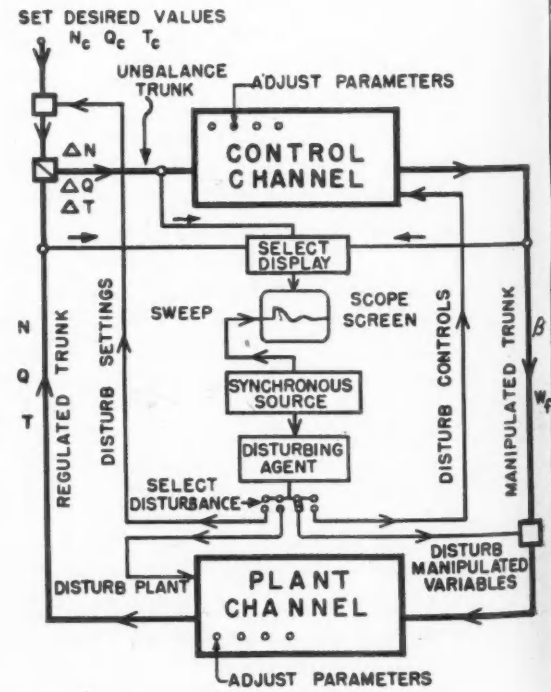


Fig. 15—Block diagram of the Analog

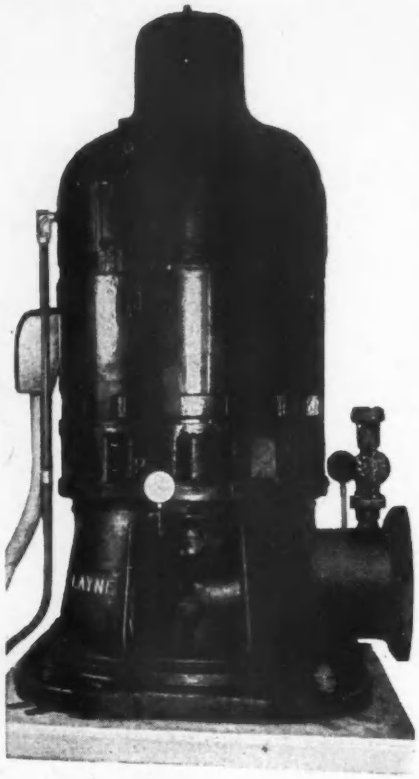
New TELEGAGES incorporate SIGNIFICANT IMPROVEMENTS

King-Seeley automotive dashboard instruments have been under continuous engineering study for 15 years, during which time many improvements have been incorporated. Now additional refinements are being added.

Heretofore, the indicating pointer of receiving instruments had a total swing of 45 degrees, but now a new pointer suspension has increased this to 70 degrees. This suspension together with a redesigned pointer provides smoother action, permits a larger dial where desired and greatly improves the instruments readability.

A new metallurgical development applied to the contacts of the sending instrument increases its service life, assures steadier readings, and generally improves its operation.

Induction soldering of critical diaphragm assemblies provides greater uniformity and increased durability.



6 MILLION GALLONS DAILY

FOR JANESVILLE, WIS.

Janesville is a mighty lucky city. Their newly installed Layne Water Supply Unit is producing over 6,000,000 gallons daily with enough water on reserve for 16,000,000 gallons daily from the same well. The drawdown beyond the six-million gallons daily is almost negligible. Such a record is greatly attributed to the soundness of Layne's fine engineering and splendid installation methods.

Every Layne Well Water Supply Unit is designed and built to produce the absolute maximum amount of water at a minimum of cost. Many installations exceed the Layne guarantee, thus richly rewarding the buyer for his confidence in the Layne Organization and their proven methods.

If your city, factory, processing plant, railroad or irrigation project needs more water Layne Engineers will gladly provide dependable water development recommendations. No obligation. For literature, address Layne & Bowler, Inc., General Offices, Memphis 8, Tenn.

LAYNE

WELL WATER SYSTEMS

vertical turbine pumps

AFFILIATED COMPANIES: Layne-Arkansas Co., Stuttgart, Ark. ★ Layne-Atlantic Co., Norfolk, Va. ★ Layne-Central Co., Memphis, Tenn. ★ Layne-Northern Co., Mishawaka, Ind. ★ Layne-Louisiana Co., Lake Charles, La., ★ Louisiana Well Co., Monroe, La. ★ Layne-New York Co., New York City ★ Layne-Northwest Co., Milwaukee, Wis. ★ Layne-Ohio Co., Columbus, Ohio ★ Layne-Pacific, Inc., Seattle, Wash. ★ Layne-Texas Co., Houston, Texas ★ Layne-Western Co., Kansas City, Mo. ★ Layne-Western Co. of Minn., Minneapolis, Minn. ★ International Water Supply Ltd., London, Ont., Can. ★ Layne-Hispano Americana, S. A., Mexico, D. F.

Publications

(*Continued from page 60*)

D-111—Unit Type Milling Machine

The Cincinnati Milling Machine Co.—Publication No. M-1622 covers the No. 000-4 Unit Type Milling Machine. Included are illustrations of the machine, principal specifications, standard and extra equipment supplied.

D-112—Alcoa Temper Designations

Aluminum Co. of America—A new booklet giving new temper designations for cast and wrought products is available. Conversion Tables giving the old and new temper designations cover nonheat-treatable alloys; wrought alloys; sheet and plate; extrusions; tubing; forgings, etc. A set of explanatory notes concludes the text.

D-113—Nickel and Nickel Alloy Tubing

Superior Tube Co.—Catalog Section No. 10 covers Nickel and Nickel Alloy small tubing. Comparative tabular data gives the physical and chemical characteristics of Nickel, Monel, K Monel, Inconel and Cupro-Nickel. Details of selection and application for these alloys has been compiled for easy reference, and practical working tables are included on commercial tolerances, standard production limits, ordering data and Superior tempers.

PERSONALS

Recent Personnel Changes and Appointments at the Plants of Automotive and Aviation Manufacturers and Their Suppliers.

Federal-Mogul Corp., Federal-Mogul Service Div.—**Basil J. Barkey**, Manager of Sales to special markets.

* * *

E. I. du Pont de Nemours & Co., Inc.—**Edward C. Harrington** has been made Manager of the newly-formed Advertising section of the Rayon Dept. **E. Hearn Simpson** has been appointed to the newly created position of Assistant Sales Manager of petroleum additives and **Barry V. Cornwall** succeeds him as Sales Manager for the alcohol and camphor section.

* * *

The Lincoln Electric Co.—**R. H. Newton**, appointed to the newly created office of Manager of Dealer Sales.

* * *

Perfect Circle Corp.—**William P. Wallace** and **Robert Jackson** have been assigned to the corporation's Detroit

(*Turn to page 94, please*)

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, AS AMENDED BY THE ACTS OF MARCH 3, 1933, AND JULY 2, 1946

Of AUTOMOTIVE INDUSTRIES, published semi-monthly at Philadelphia 39, Pa., for October 1, 1947.

State of Pennsylvania } ss.
County of Philadelphia }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared G. C. Buzby, who, having been duly sworn according to law, deposes and says that he is the Business Manager of the AUTOMOTIVE INDUSTRIES and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily, weekly, semi-weekly or tri-weekly newspaper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Acts of March 3, 1933, and July 2, 1946 (section 537, Postal Laws and Regulations), printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Chilton Company, Chestnut and 56th Sts., Philadelphia 39, Pa.; Editor, Julian Chase, 5601 Chestnut Street, Philadelphia 39, Pa.; Managing Editor, None; Business Manager, G. C. Buzby, East Sunset Ave., Chestnut Hill, Philadelphia 18, Pa.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.) Chilton Company, Chestnut and 56th Sts., Philadelphia 39, Pa.

Holders of more than 1% of the capital stock outstanding of Chilton Company: Estate of C. A. Musselman, 260 Sycamore Avenue, Merion Station, Pa.—Beneficiaries: Mabel M. Musselman, Mary M. Acton, David Acton; Charlotte M. Terhune, 160 E. 48th Street, New York, N. Y.; C. S. Baur, Thomas Jefferson Apts. No. B-51, 69-11 Yellowstone Blvd., Forest Hills, New York; Mrs. Beulah Fahrendorf, 59 Drake Road, Scarsdale, N. Y.; Mary M. Acton, 260 Sycamore Ave., Merion Station, Pa.; Mabel M. Musselman, 260 Sycamore Ave., Merion Station, Pa.; Dorothy S. Johnson, 1115 Fifth Ave., New York, N. Y.; Ann E. Tomlinson, c/o Bankers Trust Company, P. O. Box 704 Church Street Annex, New York, N. Y.; Ethel G. Breen, Trustee u-w of Charles W. Anderson, Old Greenwich, Conn.—Beneficiaries: Robert C. Anderson, Percival E. Anderson, Charles W. Anderson, Jr., Annie L. Clark; John Blair Moffett, 1608 Walnut Street, Philadelphia, Pa.—Agent for J. Howard Pew, J. N. Pew, Jr., Mabel P. Myrin, Mary Ethel Pew; Elizabeth J. Bailey and Ellwood B. Chapman, Trustees Estate of James Artman, Deceased, 930 Real Estate Trust Building, Phila., Pa.—Beneficiaries: Franklin Artman, Vera Watters, Alvin C. Artman, Elizabeth J. Artman, Marion A. Pratt, George H. Pratt, by assignment, Edwin Moll, by assignment: Frederick S. Sly, 149-40 35th Ave., Flushing, L. I., N. Y.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (if there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders, and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the twelve months preceding the date shown above is . (This information is required from daily, weekly, semi-weekly, and tri-weekly newspapers only.)

G. C. BUZBY, *Pres. & Bus. Mgr.*

Sworn to and subscribed before me this 22nd day of September, 1947.

PHILIP J. SHIRE, JR.

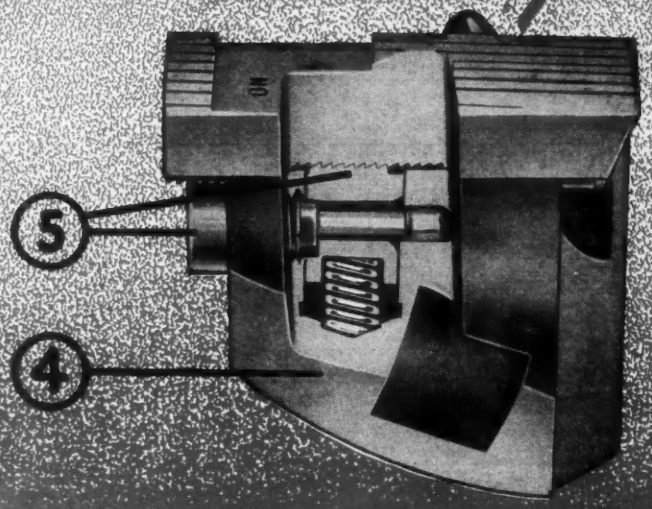
(My commission expires January 7, 1951).

[SEAL.]

Five Good Reasons Why...

JONES & LAMSON

Ground Thread TANGENT CHASER DIE HEADS



PRODUCE BETTER THREADS at LOWER COST!

THREAD QUALITY

1. The Die Heads are hardened and ground throughout. The body is not only ground, it is lapped on the face and in the dovetail slots. The bearing surfaces of the chaser holders are also ground and lapped into the body.

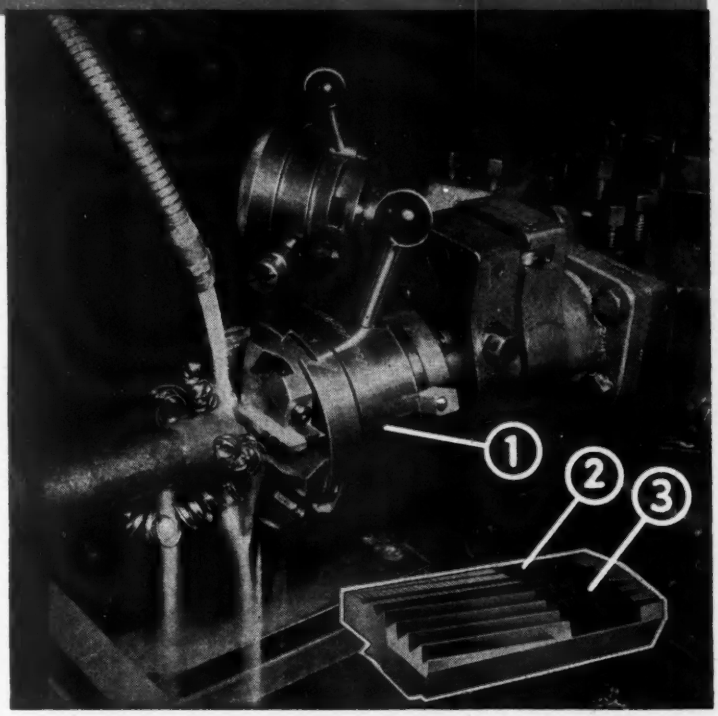
2. Jones & Lamson Ground Thread Tangent Chasers are *guaranteed* to produce threads to Class III specifications.

3. *The exact helix angle, in fact all the elements of an accurate thread are ground into the chasers after hardening.* The possibility of poor quality threads and costly scrap, due to faulty chaser setting, is eliminated.

ECONOMY

4. With a single set of chaser holders, any thread, within the rated capacity of the holders can be cut, regardless of helix angle, eliminating the expense and trouble of constantly changing holders for different helix angles.

5. Chasers are easily and quickly set. Ratchet-teeth on the back of the chasers, corresponding to ratchet-teeth in the holders, provide definite locating points for resharpening, measuring and setting. The chasers are positively and quickly secured. A couple of turns of a single screw releases or secures them in the holders.



If you are interested in greater economy and better quality in threading, fill in the coupon and we will send you our valuable handbook "Thread Elements and Formulas", together with complete information about our Die Heads.

JONES & LAMSON
MACHINE COMPANY
Springfield, Vermont, U. S. A.

Manufacturer of: Universal Turret Lathes, Fay Automatic Lathes, Automatic Double-End Milling and Centering Machines, Automatic Thread Grinders, Optical Comparators, Automatic Opening Threading Dies and Chasers, Ground Thread Flat Rolling Dies.

JONES & LAMSON MACHINE COMPANY
DEPT. A, SPRINGFIELD, VERMONT, U. S. A.

Please send me your handbook "Thread Elements & Formulas", and complete information about your Threading Dies.

NAME_____

TITLE_____

FIRM_____

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AA

COUPON

Personals

(*Continued from page* 92)

office as members of the sales engineering staff.

* * *

Westinghouse Electric Corp.—**John E. Payne,** named Manager of all Industry Sales Departments. **R. S. Kersh,** named Manager of Industrial Sales, succeeding Mr. Payne.

* * *

General Electric Co.—**Addison E. Wiles,** appointed Manager of Pittsfield Molded Products Works, division of General Electric. **Dr. James J. Pyle** was elected to the Board of Directors of Locke Insulator Corp. He is director of General Electric's Plastic Div. laboratory at Pittsfield.

* * *

Ranger Aircraft Engines Div. of Fairchild Engine and Airplane Corp.—**F. E. Newbold, Jr.,** appointed manager of engineering operations. **L. Paul Ahlers** has been made Assistant to the General Manager and **S. G. Nordlinger,** Director of Sales. **Eric Preece,** formerly of Curtiss-Wright Corp., has joined the Ranger division as Product Engineer.

L.G.S. Spring Clutch Corp., Div. of Curtiss-Wright Corp.—**James C. Esterline** has been named General Manager.

* * *

Stinson Div. of Consolidated Vultee Aircraft Corp.—**Joseph P. Shaw** has been appointed Asst. Sales Manager.

* * *

Hupp Corp.—**Harry W. Holt,** named General Sales Manager.

* * *

Caterpillar Tractor Co.—**Lloyd J. Ely** named head of company's new Diesel engine factory; **John Elwood** will have charge of all Diesel track-type tractor production and **Arthur W. Johnson** becomes Factory Manager in charge of manufacture of Diesel wheel-type tractors, Diesel motor graders and cable controls and the final assembly of bulldozers, scrapers and rippers.

* * *

Hudson Motor Car Co.—**Tim May** has been appointed Service Promotion Manager.

* * *

The American Welding Society—**Harold O. Hill,** Asst. Chief Engineer, Fabricated Steel Construction, Bethlehem Steel Co., has been elected President of the Society.

* * *

Aircraft Screw Products Co., Inc.—**Harry E. Sweet,** appointed Factory Manager.

* * *

Casco Products Corp.—**Wallace R. Powell** has been made Asst. Sales Manager of the Automotive Div.

* * *

Spicer Mfg. Div., Dana Corp.—**Robert P. Lewis** has been made Executive Engineer.

* * *

Romec Pump Co.—**J. P. Johnson,** elected president.

* * *

United Specialties Co.—**Hal H. Smith, Jr.,** has resigned as a director of the company. **Francis S. Wilson, Jr.,** was elected to fill the vacancy.

* * *

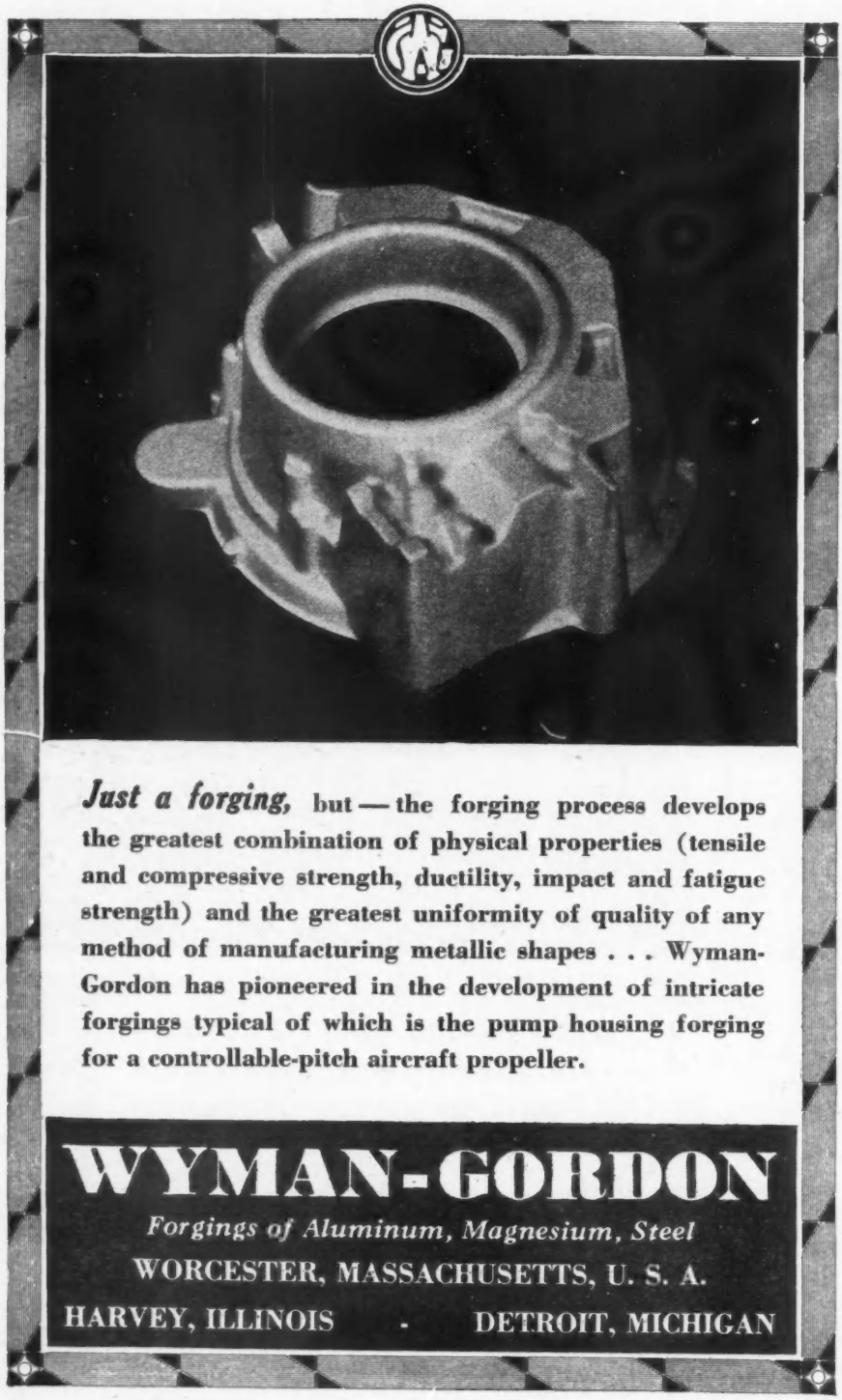
American Chain & Cable Co., Andrew C. Campbell Div.—**V. E. Lysaght,** Director of Sales.

* * *

Walter Kidde & Co., Inc.—**Stuart Grant,** appointed Advertising Manager.

* * *

Snyder Tool & Engineering Co.—**Clarence Snyder,** elected Chairman of the Board.



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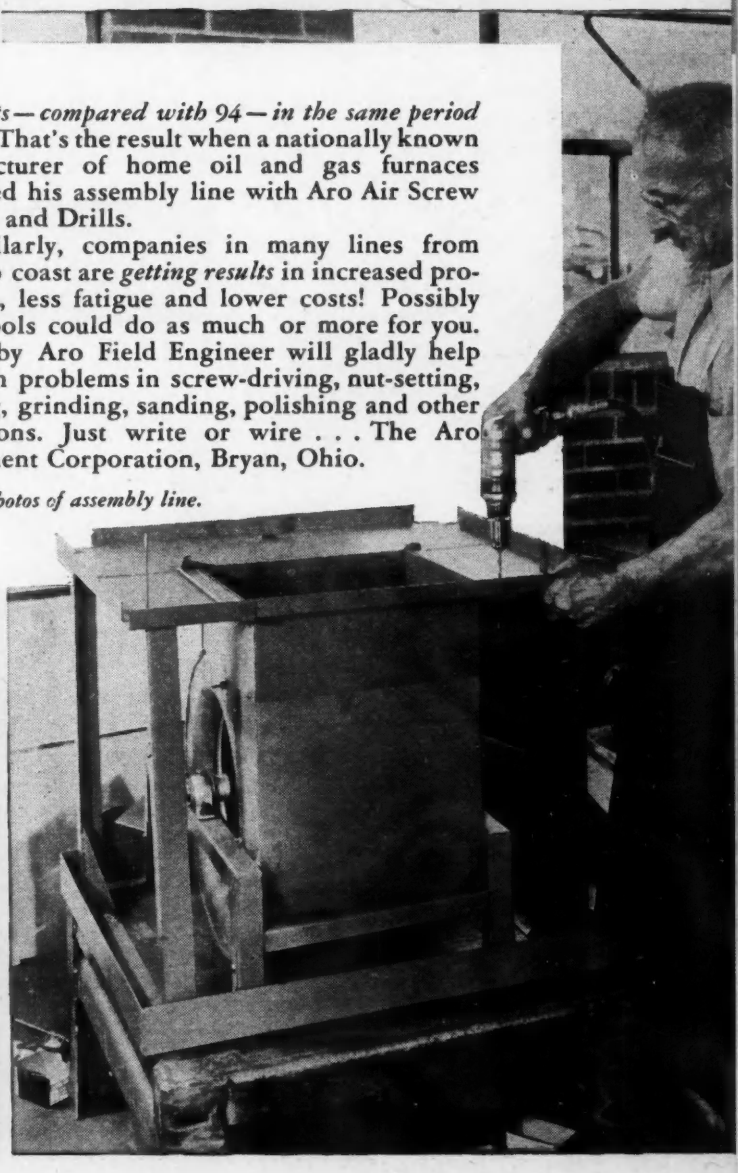
Actual photos of assembly line.



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Hercules Adds Six Diesels

(*Continued from page 29*)

built for automotive application as well as industrial and railroad applications where high speed, light weight and maximum reliability are required. The stripped engine weighs approximately 4200 lb. The overall length from the front of the fan blade to the rear of the bellhousing is 56½ in.

For special application where still more power is required, Model DNX-V8 is equipped with a supercharger. In doing this the company is drawing on its long experience during the last war when it built many thousands of supercharged engines for the United States Navy. The supercharged DNX-V8 develops 500 hp at 2100 rpm. The supercharger on this engine is gear driven and is an integral part of the engine itself. The stripped engine weighs approximately 4600 lb.

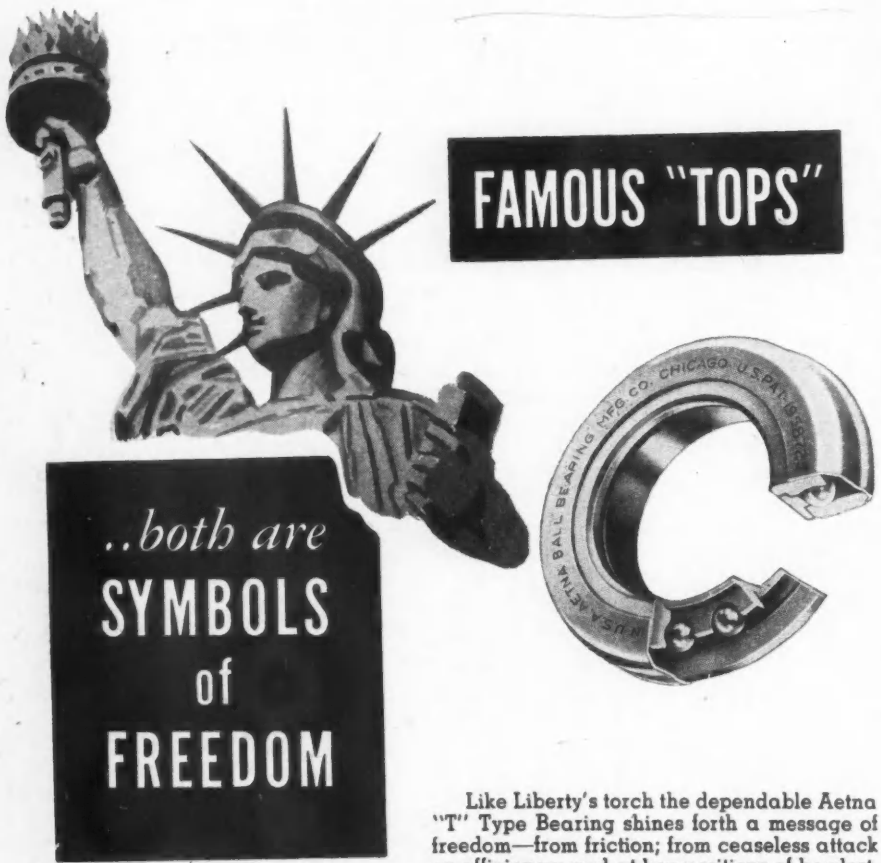
All of the Hercules Diesel engines described here are designed and built along the same fundamental principles used in five series of six-cylinder Hercules Diesel engines since 1933. They are the solid injection, compression ignition, four-stroke cycle type. The patented Hercules combustion chamber safeguards operating efficiency. The Hercules combustion chamber is located at the side of the cylinder bore. During operation, as the piston proceeds to the end of its compression stroke, it passes across the passageway between the cylinder and the combustion chamber, thereby reducing its area and greatly increasing the velocity of the air passing into the combustion chamber. This velocity reaches its maximum just before the piston reaches the top of its compression stroke. At this time the air is moving at 50 times crankshaft speed—and into this swiftly revolving air the fuel is injected.

Two New Gasoline Models

To the Hercules line of 13 series and 27 models of high speed, heavy-duty gasoline engines have been added two models especially designed to meet the greater need for stepped up power requirements. The Hercules six-cylinder model TDXB has a 4⅜ in. bore and 5¼ in. stroke. It develops 160 hp at 2600 rpm. Piston displacement is 474 cu in. The stripped engine weighs approximately 1345 lb. Six-cylinder Model RXLDH has a 4¾ in. bore and 5¼ in. stroke. It develops 180 hp at 2600 rpm and has a piston displacement of 558 cu in. The stripped engine weighs approximately 1470 lb.

Both of these Hercules six-cylinder gasoline engines have a lot in common. The high horsepower output in both instances is obtained through enlarged intake and exhaust porting, proper manifolding and valves, plus a careful engineering of all components that influence increased horsepower without sacrificing smooth, dependable performance and the highest degree of operating efficiency. Some of these components are: seven bearing Tocco-hardened, counterbalanced crankshaft; positive oil seal at front and rear of crankshaft; copper-lead lined main and rod bearings, bored in place; full floating piston pin; valve rotators prevent burning and sticking of valves; packless seal water pump of high capacity and with positive gear drive; large capacity oil pump; high compression, high turbulence cylinder head; fan assembly mounted on roller bearings.

Between the Hercules Diesel engine line and that of the Hercules gasoline engines, the company is now in a position to offer to the trade a combined total of 22 series and 49 models of engines in a power range from 3 to 500 hp and piston displacement from 39 cu in. to 1468 cu. in.



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- oil impregnated bronze retainer for smooth, silent bronze-to-steel contact
- permanently sealed-in lubricant

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